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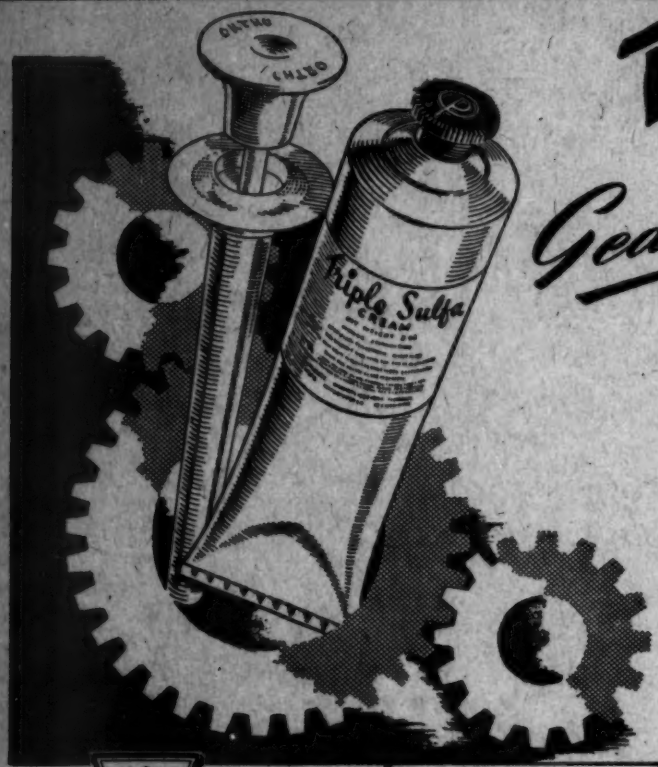

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BRITISH MEDICAL JOURNAL

LONDON SATURDAY SEPTEMBER 4 1948

ACCIDENT AND OPPORTUNISM IN MEDICAL RESEARCH*

BY

Sir HENRY DALE, O.M., G.B.E., F.R.C.P., F.R.S.

My title speaks of accident and opportunism, and it hardly requires to be said that the two must go together if accident is to have any value, if it, indeed, is to be anything but a hindrance to research of any kind. Perhaps it is one of the important qualifications for success in research that a man should know by the subconscious reasoning which we call instinctive judgment whether what appears to be an accident, a phenomenon presenting itself quite unexpectedly, is just a nuisance, the result of some trivial error, so that the further study of it will lead to nothing but waste of time and energy, or whether on the other hand it offers a possible clue to some new discovery of real importance which ought to be followed even at the cost, perhaps, of a diversion from the original objective. The same idea has often been expressed by saying that accidents fruitful in discovery happen only to those who deserve them—to those, we may say, in whom a natural aptitude has been reinforced by stored and ripened experience, so that a trained alertness, which does not distract the attention or weaken its concentration on the chosen objective, holds the mind ready to pounce on an unexpected opportunity. If we were called upon to construct a scale of values for the different kinds of scientific research we might feel bound to accord the highest rank to the kind of investigation which can be systematically planned in advance, such as one which sets out to interpret by mathematical analysis a set of astronomical or physical data, but accidents of the useful kind have sometimes been effective even in attracting and, as it were, refocusing the attention of some of the greatest of mathematical theorists. You will remember how Archimedes, the greatest mathematician of his own and one of the greatest, I suppose, of all ages, found the clue not only to the solution of the practical problem concerning the adulteration of the gold used for the king's crown but to one of the fundamental laws of hydrostatics in a sufficiently commonplace accident—the overflowing of his bath when he lowered his body into the water. Some nineteen centuries later the young Isaac Newton, driven home to Woolsthorpe from Cambridge by the arrival here of the plague, had been directing his astonishing powers to an attempt to discover a cause for the orbital motion of the moon round the earth and of the planets round the sun. Remembering later those years when he was yet only 23 to 24 years old, he wrote of himself: "I was in the prime of my age for invention and minded mathematics and philosophy more than at any time since"; and on that alert and receptive mind the sight of an apple falling from a tree in the Woolsthorpe garden acts like a trigger, and it comes to him in a flash that the gravity which pulls the apple to earth is holding the moon in its orbit; and he plunges into the calculations which, when some 20 years later they were given to the world in the *Principia*, were so completely to reshape men's ideas of the universe.

I could find other examples, if we required them, of the way in which theoretical and experimental investigators in the fields of pure physics and chemistry have on occasion been able to take advantage of accidental observations to make great new advances in their various special fields. Accident certainly played some part, though probably not so great a part as popular rumour has sometimes suggested, in those great discoveries a little over half a century ago of the *x* rays by Röntgen and of the radioactivity of uranium by Becquerel which together contributed so much to the launching of physics into its new era. Certainly they did not belong to the same class as the discoveries which most people were expecting to arise from the natural and straightforward development of the physical knowledge of the day. I have a very clear recollection of the interest which they aroused when the news of them first came to Cambridge in my second and third undergraduate years.

Röntgen's discovery of the *x* rays with their remarkable penetrating properties, enabling them to pass freely through flesh and to cast shadows of the bones on a fluorescent screen, was first made known here by reports in the daily press; and I well remember a friend of some seniority telling me that he had been at a dinner party at which this reported marvel had been the prevailing subject of conversation, of which the general tone was to ridicule it as a piece of journalistic nonsense; until the only member of the party whose knowledge and judgment gave him a real title to an opinion, J. J. Thomson, broke into the babble of sceptical merriment with a strongly expressed conviction that the report would prove to be true; so far from being nonsense, it was the kind of discovery which he would expect somebody to be making soon. And then in the following year, at a meeting of the undergraduates' Natural Science Club, my contemporary, R. J. Strutt (the late Lord Rayleigh), gave us an account of Becquerel's then new discovery that salts of uranium were continuously emitting a mysterious radiation to which a photographic plate was sensitive; and I well remember the sceptical protest of one of us who was later to become world-famous in theoretical physics and astronomy. "Why, Strutt," said he, "if this story of Becquerel's were true it would violate the law of the conservation of energy!" Such a reaction may well seem strange in these days, when the senior schoolboy can tell you about Einstein's theory of the convertibility of matter into energy and its realization in the atomic bomb. But it represented then a quite reasonable orthodoxy, and

*Being the Popular Lecture delivered on July 2 at the Annual Meeting of the British Medical Association, Cambridge, 1948.

I like to remember the enterprising spirit of Strutt's rejoinder: "Well, all I can say is, 'so much the worse for the law of the conservation of energy,' because I am quite sure that Becquerel is a trustworthy observer." And, of course, none of us had then any inkling of the enormous expansion of knowledge for which discoveries such as these were to provide the points of origin, or of the whole armoury of physical resources which would thus be brought to the service of medicine. This is even now receiving a reinforcement of yet unmeasured magnitude from the forward leap which knowledge in nuclear physics has made in these recent years, and on the uses of which so much of the world's hopes and so much of its fears are now centred.

Medical Research

The mention of such applications to the service of medicine brings me at last to the subject of my paper—the part played by accident and opportunism in medical research, which is the field of scientific activity of which I can speak from some personal experience, and the one which we may regard as specially appropriate to this occasion. Medical research as we know it to-day has spread its tentacles widely, and there is hardly any branch of experimental science now which may not find itself seized and pressed into the service, constrained to contribute from some angle, either directly or from a distance, to the scientific basis of modern medical knowledge and practice. That, however, is a very recent development; modern medical research as an experimental science, or a varied group of experimental scientific disciplines, had not begun a hundred years ago, and was only just beginning to get really under way at the beginning of the present century. Yet medical knowledge was making important advances at the end of the eighteenth and in the first half of the nineteenth century at the hands of the great physicians of those days, who used to the full the opportunities which they encountered by accident in their practice, enabling them to observe the regular recurrence of symptoms and conditions which others had passed unnoticed. Thus the immunity from smallpox of those who had infected their hands with the cow-pox appears to have been a matter of common belief with the dairymaids and other country folk among whom Edward Jenner practised in Gloucestershire. None of the other medical men of the neighbourhood, however, had observed the fact, much less recognized its significance; they even threatened, jestingly we may hope, to expel Jenner from their Convivio-Medical Club if he continued to bore them with such nonsense. So he waited for many years, accumulating data as accident gave him opportunity, until at length in 1796 he followed the advice given long before by his friend John Hunter and tried the experiment, inoculating a boy with cow-pox and, when that had passed, proving him to be completely refractory to inoculation with smallpox. Jenner, then, in the light of later developments may be regarded as having found already, long in advance of his time, the bridge between the method which waits for opportunities of observation to be provided by nature and encountered by accident and that which puts a possibility to deliberate test under the critical and controlled conditions of experiment. And I propose now to bring to your special notice a few out of a large number of possible instances of the way in which the use of opportunity provided by accident has made contributions, some of them of the very highest importance, to the progress of medical knowledge by research even in its more recent and still flourishing experimental period.

This revolutionary change in the methods of advancing medical knowledge began, as I have suggested, in the second half of the nineteenth century; and if anybody was asked to name the important factors of its beginning and its promotion he could not fail to give to the work and the discoveries of Louis Pasteur, and to the whole science of bacteriology which grew out of them, a leading place among these factors. Everybody knows that it is to the discoveries of Pasteur that we can trace the first clear recognition of living and self-multiplying micro-organisms, yeasts and bacteria, as responsible for the familiar processes of fermentation and putrefaction, and then for diseases transmitted by infection and contagion. I do not think, however, that it is so generally known that accident—a whole series, indeed, of accidental and extraneous circumstances—played a very prominent part in engaging and focusing Pasteur's attention for the remainder of his life on studies which were widely divergent from the line of his original scientific interests and activities. For Pasteur began his scientific career as a mineralogist and a crystallographer. His first great discovery concerned the crystallography of the two isomeric forms of tartaric acid and revealed their true relation to racemic acid. It was he who discovered that the two forms which in solution rotate the plane of polarized light in opposite directions have crystals with forms related to one another as that of an unsymmetrical object is related to its image in a mirror—a discovery as fundamental to organic chemistry as to crystallography, and one which might well, one thinks, have occupied the rest of his life in its direct development. But a mould, a *Penicillium*, grew by accident on his solution containing both the forms of a tartrate; and Pasteur found that, as it grew, it selectively used and destroyed only the form producing right-handed rotation of the plane of a polarized beam, so that the left-rotating tartrate remained. And then, with his mind thus rendered alert to the new idea of a selective fermentation as due to the action of living and multiplying organisms, Pasteur was given additional stimulus and opportunity in that direction by his appointment to a chair of chemistry at Lille, where practical problems of fermentation in the local distilling industry were waiting for his ripening genius to begin the great clarification. And soon his success led to appeals to him to investigate the causes of the variable results encountered in the fermentative production of vinegar and in the brewing of beer, and he was summoned then to deal with the diseases of wine in his own native countryside; and in every case he was able to identify and to separate the micro-organisms responsible for the desired fermentation and to show the way to eliminate those which diverted it harmfully. And then, of course, his success with the diseases of wine involved him in insistent pleas that he would direct his researches to the elimination of the infectious disease known as "pébrine" from silkworms. And thus the train was laid for the great revolution in the pathology and eventually in the treatment of infectious diseases through the further work of Pasteur himself and his immediate pupils in Paris, of Koch in Germany, of Lister in this country, and of all the great host of their disciples and followers throughout the world, right down to the present day, who have caught and carried forward the flame first kindled from the interest of a man of genius in the crystallography of the tartaric acids and in the accidentally observed effect of a mould which grew on them.

Beginning of Endocrinology

As another leading factor in the great change which has come over the whole aspect of medical knowledge and research we should certainly mention the rise of experimental physiology and, later, of biochemistry. And among the special fields of investigation in the general domain of these, which have had a specially direct influence on knowledge of diseases and their treatment, we might well mention those concerned with the hormones and the vitamins. And here again, if we look at the beginnings of experimental

activity in both these fields, we shall find the exploitation of happy accident playing a part of real importance.

The real beginning of scientific endocrinology, the study of the internal secretions or hormones, may be found, I suppose, in the brilliant use which great English physicians of the middle of the nineteenth century made of their opportunities, presented by accident, for accurate observations at the bedside and in the post-mortem room: when Thomas Addison described the malady known by his name and recognized its regular association with destructive disease of the suprarenal gland, and when William Gull described myxoedema as a kind of adult cretinism and traced it to atrophy of the thyroid gland. But nobody in 1889 had any idea that the much commoner disease diabetes mellitus had any connexion with the defect of a gland or the lack of an internal secretion. In that year Professor von Mering, of Strasbourg, asked his assistant professor, Minkowski, to remove the pancreas from a dog by operation in order that they might study the absorption of fat from the intestine in the absence of that gland. So, purely by accident, it was discovered that the dog without a pancreas showed an abnormal hunger and thirst and passed large volumes of urine, which Minkowski found to be loaded with glucose. Naturally he turned aside to investigate the condition more closely, and point by point he found it to correspond with a severe diabetes mellitus as this had long been known in the human patients whom it afflicted. But more than thirty years were to pass before this discovery was made fully effective for medical practice by the determined enterprise of two young Canadians, Banting and Best, who, after many experienced investigators had failed, demonstrated the possibility of preparing the missing hormone, insulin, from the pancreas and therewith changed completely the prospect of the sufferer from diabetes. More than that, I think that it cannot be doubted that the stimulus due to Banting and Best's success was an important factor in the astonishing advance which research began at once and continues still to achieve over this whole field of knowledge of the endocrine glands and their hormones. Let me mention just one item. But a few years ago the disease known as pernicious anaemia, or sometimes as Addison's anaemia, was as completely beyond the reach of effective remedy as diabetes had earlier been, when a team of physicians in Boston (Mass.) discovered that a hormone could be prepared from the liver by the use of which the prospect of the sufferer from pernicious anaemia has been transformed as completely as that of the sufferer from diabetes by insulin. The senior member of that Boston team, Professor Minot, is himself a sufferer from diabetes, and insulin had come just in time to save him from a premature death and to fit him to take a leading part in the discovery which is now saving others from pernicious anaemia. Is it fanciful, then, to find in Minkowski's enlightened use of the opportunity which accident offered him in 1889 the real starting-point for work which has now led to the effective treatment of more than one disease regarded till a few years ago as beyond any hope of remedy?

Nutrition and Biochemistry

There has been a good deal of discussion, in an entirely friendly spirit, concerning the real starting point of the researches which led to the recognition of the vitamins and thus to the specific and effective treatment or prevention of a number of other formerly mysterious diseases now known to be due to the lack of one or another of these trace-constituents of a normal diet. There is one accidental observation, used to remarkable purpose by the late Sir Frederick Gowland Hopkins, which must, I think, be regarded as the first link in a chain of discoveries by which that great investigator was led to his first recognition of the factors which we have come to call the vitamins. One student in Hopkins's early advanced class at Cambridge, the late John Mellanby, who was long afterwards the distinguished occupant of the Oxford Chair of Physiology in succession to Sherrington, was curiously unable to obtain the colour reaction for proteins which a certain Adamkiewicz had described, and Hopkins himself found that with the particular bottle of acetic acid on Mellanby's shelf it was indeed unobtainable, though that from all the other bottles in the laboratory gave it readily. He did not put the matter aside as one of those queer anomalies and content himself with telling Mellanby to borrow the reagent from his neighbour; he recognized, with his remarkable instinct, that here was something of potential importance, and with the assistance of another member of the class, S. W. Cole, he immediately began the investigation which led them to the discovery that the reaction was due to glyoxylic acid, which almost all specimens of acetic acid contain as an impurity. Then, with a more effective reagent, they were able to isolate the constituent of proteins giving this and another well-known colour reaction and to identify it as a new amino-acid, tryptophane. And then Hopkins undertook experiments to determine the degree to which each of the different amino-acids which had then been identified, tryptophane among them, was a necessary constituent of a diet for maintenance and growth, and thus he was led further to the discovery that young rats could not grow, or even maintain their weight, on food made up from all the *known* constituents of a complete diet in abundance if these had been elaborately purified. So it was made clear that there were unknown factors of a normal diet, minute in quantity but essential to make the food adequate in quality for normal nutrition; and biochemistry was launched upon what soon became a world-wide expedition of research, still in progress, in pursuit of the vitamins.

Many of you, I think, will have heard of "Ringer's solution"—a watery solution of salts in carefully adjusted proportions with which the late Dr. Sidney Ringer was able to maintain the heart removed from the body of a dead frog in vigorously beating activity for hours. Ringer was a physician to University College Hospital, and, in such time as he could spare from his practice, one of the pioneers of pharmacological research in this country. In his early experiments he had found that a solution containing only pure sodium chloride, common salt, in the proportion in which it is present in the serum of frog's blood would keep the beat of the heart in action only for a short time, after which it weakened and soon stopped. And then suddenly the picture changed: apparently the same pure salt solution would now maintain the heart in vigorous activity for many hours. Ringer was puzzled, and thought for a time that the difference must be due to a change in the behaviour of the frog's heart with the season of the year—until he discovered what had really happened. Being busy with other duties, he had trusted the preparation of his solutions to his laboratory boy, one Fielder; and as Fielder himself, whom I knew as an ageing man, explained to me, he didn't see the point of spending all that time distilling water for Dr. Ringer, who wouldn't notice any difference if the salt solution was made up with water straight out of the tap. But, as we have seen, Ringer did notice the difference; and when he discovered what had happened he did not merely become angry and insist on having distilled water for his saline solution, he took full advantage of the opportunity which accident had thus offered him and soon discovered that water from the tap, supplied then to North London by the New River Company, contained just the right small proportion of calcium ions to make a physiologically balanced solution with his pure sodium chloride; and when, guided by

further analysis, he had also added the correct small proportion of a potassium salt, Ringer's solution was complete, and with the later modifications which Locke, Tyrode and others introduced to make it suitable for the tissues of other animals it has become an essential reagent for everyday use in an immense range of medical and biological research procedures.

Adrenaline and Acetylcholine

Some fifteen years later another observation, also of far-reaching effect on the progress of physiology, was made in the same laboratory at University College in circumstances which, if not entirely accidental, had at least something of that character. Dr. George Oliver, a physician of Harrogate, employed his winter leisure in experiments on his family, using apparatus of his own devising for clinical measurements. In one such experiment he was applying an instrument for measuring the thickness of the radial artery; and, having given his young son, who deserves a special memorial, an injection of an extract of the suprarenal gland, prepared from material supplied by the local butcher, Oliver thought that he detected a contraction or, according to some who have transmitted the story, an expansion of the radial artery. Whichever it was, he went up to London to tell Professor Schäfer what he thought he had observed, and found him engaged in an experiment in which the blood pressure of a dog was being recorded; found him, not unnaturally, incredulous about Oliver's story and very impatient at the interruption. But Oliver was in no hurry, and urged only that a dose of his suprarenal extract, which he produced from his pocket, should be injected into a vein when Schäfer's own experiment was finished. And so, just to convince Oliver that it was all nonsense, Schäfer gave the injection, and then stood amazed to see the mercury mounting in the arterial manometer till the recording float was lifted almost out of the distal limb.

Thus the extremely active substance formed in one part of the suprarenal gland, and known as adrenaline, was discovered. And in due course there came to light the curious correspondence between the effects produced by this potent substance and those produced by nerves of the so-called sympathetic system; and Professor T. R. Elliott, then a postgraduate research student in Cambridge, was led to make the brilliant suggestion that these sympathetic nerves produce their effects by liberating small quantities of adrenaline at the points where they end in contact with muscle fibres and gland cells. Some ten years later it came to my notice by sheer accident that a particular extract of the drug known as ergot of rye exhibited a curious and very potent type of activity. With the co-operation of my chemical colleague at the time, Dr. Ewins, the substance responsible was isolated from the ergot extract and identified as the acetic-ester of the base choline, acetylcholine. And when the actions of this came to be examined in detail they showed as suggestive a correspondence to the effects of other nerves as those of adrenaline had shown to the effects of the sympathetic nerves in particular. At that time there was no reason at all to believe that acetylcholine was a natural constituent of the animal and human body; but my late colleague, Dr. Dudley, and I found it there some 15 years later, again by accident, when we were looking for something else. And meanwhile my friend of many years, Professor Otto Loewi, then of Graz but now in New York, by experiments of a most elegant simplicity had directly demonstrated, in confirmation of Elliott's much earlier suggestion, that impulses passing down the fibres of different nerves to the frog's heart do in fact produce their effects by liberating at the junctions of the nerve with the muscle fibres one or the other of two substances; and these two substances were found to be identical with adrenaline and acetylcholine in all the properties for which they could be tested. And further developments, in which I have again taken a part, entitle me to believe that even at this moment impulses passing down nerve fibres are liberating tiny charges of acetylcholine where these fibres end in the muscles of my tongue, my lips, my larynx, and my diaphragm and are throwing these into the complicated and varying patterns of speech, which, I hope, contrives none the less to be reasonably articulate.

Histamine and Penicillin

The intimacy of direct experience may to some extent justify this mention of incidents involving my own activities alongside the examples of the far-reaching importance of the part which accident may play in medical research which I have cited earlier. If further excuse is needed, I may plead that the function of acetylcholine as a transmitter of nervous effects figured prominently in a discussion meeting held here yesterday in one of the scientific sections of the British Medical Association. There is even something of the nature of an accident in the fact that this morning another of the sections had a discussion on a novel group of remedies called "Antihistamine substances"; for histamine is another base which came to my notice by accident, some 40 years ago, as accounting for the special activity of another kind of extract from the same curious drug, ergot of rye. When histamine had thus been isolated and identified by my late colleague, Professor George Barger, it proved to have an action reproducing most of the symptoms characteristic of an "anaphylactic" or "allergic" reaction—a type of reaction which will be familiar to most of you in the special forms of hay-fever, nettle-rash, and some forms of asthma. Then I had another stroke of luck. I was studying a rather weak activity of a similar kind which fresh blood serum exhibited when it was applied to strips of involuntary muscle taken from a dead guinea-pig, and I suddenly encountered a strip of this tissue from one particular guinea-pig which responded with a contraction of peculiar violence when it was treated with a mere trace of horse serum, though it behaved quite normally in the presence of blood serum from other animals—cat, dog, rabbit, sheep, or man. And it occurred to me that many guinea-pigs in that laboratory were used for testing the strength of antitoxic horse serum, and that an economically minded colleague might have provided me with a survivor from such a test. The verification of that suspicion gave us a new idea about the meaning of the anaphylactic or allergic condition; but it took many years more, and a great deal of work in many laboratories in different countries, before we were able to establish the fact that histamine is a natural constituent of most cells of the living body which is normally held harmless and inactive in their interior but is released, so as to produce its characteristic effects, if the living cells come into contact with some substance from a plant or animal—grass pollen, scurf from a skin, and so forth—to which they have become abnormally sensitive or allergic. And now, here in Cambridge, only this morning we have been discussing the action of "antihistamines"—substances for which it is claimed that they relieve the symptoms by preventing the action of histamine when this is set free by the effect on allergic cells of the substances for which they have acquired a specific sensitiveness.

There is one more example which I must mention, even if only because it will certainly, and most properly, be already in the minds of many of you—the discovery of penicillin. The contamination of a bacterial culture growing upon a plate of solid nutritive medium by the spore of a mould falling on it while the cover is removed for examination must be a frequent and usually no more than a mildly

annoying incident of bacteriological practice. It was the chance coincidence of three conditions which made its occurrence on a particular plate in 1929 the starting point of a discovery of first-rate importance. (1) The contaminating spore was that of one particular mould species, *Penicillum notatum* ; (2) the culture on the plate was that of a staphylococcus, susceptible to the restraining effect of an antibacterial agent which this mould produced ; and (3), most important of all, the worker concerned was Professor Alexander Fleming, with the eye of a medical naturalist, alert to detect the unusual phenomenon of a kind of halo round the spot where the mould colony grew, free from colonies of the staphylococcus which grew abundantly over the rest of the plate. Sir Alexander Fleming, as you know, picked off the mould colony and cultivated it in a broth, and found that the broth contained an antibacterial agent which he named penicillin. Then, as happened with Minkowski and the pancreatic hormone, neither Fleming nor anyone else for some years could hold out any hope of the chemical isolation or even of a substantial purification of penicillin, to say nothing of its eventual production in a form and in a quantity enabling its therapeutic possibilities to be critically tested. Such a possibility had in fact been practically written off the account and almost forgotten until, like Banting and Best with insulin, Sir Howard Florey and his chemical collaborators took it up with determined energy and with brilliant and resourceful enterprise ; and now the research chemists and the organized therapeutic industry of half the world have combined to exploit and develop this gift of an alert opportunism and to make it a practical reality for human need. And the chemists have isolated several penicillins, determined their constitutions, and even made one of them by synthesis. And this success has had value not merely for its own sake, it has opened up a most hopeful vista of other and perhaps equally important discoveries in the same field, streptomycin, chloromycetin, and others yet to come.

Of course there are plenty of other instances to be found of opportunity coming to an attentive worker in research through what we have to regard as chance or accident ; and, apart from the many which could be collected, there must be innumerable cases which will never be recognized because no record of them has been preserved. I hope, however, that my choice of a subject and citation of examples will not bring me under the suspicion of suggesting that accident is the principal factor of success in research of any kind, or of medical research in particular. Accidents of the kind which we have been discussing do not, in fact, happen to the merely fanciful speculator who waits on chance to provide him with inspiration. They come rather to him who, while continuously busy with the work of research, does not close his attention from matters outside this principal aim and immediate objective but keeps it alert to what unexpected observation may have to offer. I certainly do not believe that any research work of permanent value is done, or any discovery of importance soundly established, without a great deal of hard, systematic, and conscientious work.

Then I should not like to be misunderstood as suggesting that mankind would have been left in permanent ignorance of any of the items of scientific knowledge, great and small, which I have cited through default of the accidents which were in fact associated with their discovery. If Archimedes' bath had failed to overflow, or the falling apple to catch Newton's attention, the principles which they gave to the world would not have remained hidden for ever, and probably not for long. We know in fact that Hooke, Wren, and Halley were actually competing in speculation about an inverse-square law of gravity and the moon's orbit without being able to calculate the relation ; and that it was the news, indeed, of such an approach to its independent discovery which acted as a stimulus to Newton, leading him to publish at last what he had known in principle and worked upon intermittently for over 20 years. We cannot be so certain in other cases, but it does not seem likely that the effects of removing the pancreas, or of injecting a suprarenal extract into a vein, would have remained very long unknown even if von Mering had not called on Minkowski to perform the one for another purpose, or if Oliver had not goaded a reluctant and sceptical Schäfer into trying the other. Incidents of the kind which I have described may greatly advance the date of a discovery or may associate it with the name of a particular investigator, but I do not believe that they will ever produce discoveries which would not eventually be made without them. They may provide, however, touches of highlight in the varied landscape of science, of decoration to its solid building, or of light relief to the more serious drama of its normal and logical advancement. And if they have thus lent something of life and colour and everyday interest to an hour of talk about medical research they have helped me to achieve a large part of my intention.

THE PROBLEMS OF CLINICAL RESEARCH

BY

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First-class clinical research has been and is being done by men busily engaged in practice. For examples in my own generation I think of J. W. Brown's work on congenital heart disease, Cookson on thyrotoxicosis, or Sheldon on haemochromatosis. In a delightful article called " Clinical Research with a Notebook " Alvarez (1946) has illustrated the good research work done by what he calls small-town doctors. The man in practice has the best opportunity of carrying out clinical research in depth, the intimate and prolonged study of people to learn what happens to individuals with certain constitutions or chronic diseases. If in the rest of this article I refer to clinical research by whole-time workers in hospitals or institutes it is not that I forget these facts but rather that I am addressing myself to those who wish to make clinical research their career or major interest and to those who should provide the facilities for them. I must ask to be excused, likewise, for quoting examples from the work of my own department.

Simon Flexner (1939) said that one of the essentials for successful clinical research was the power of the researcher to command his time for the patients, from whom the research problems are derived, and for the laboratory, in which those problems are investigated. No man in a busy practice can command his time, and for this reason great men like Richard Bright have found it impossible to continue clinical research when they have made a name in practice. The young man who wishes to engage in clinical research in this country should usually work whole-time in a hospital or a research institute. The opportunities for this type of employment have been greatly enlarged by the increased funds which are now at the disposal of the University Grants Committee and the Medical Research Council. Nevertheless, whereas medical practice may be regarded as a stairway, in which the opportunities do not diminish as a man advances in years, the academic and research

career will always be like a pyramid, with more room at the bottom than at the top.

A Recurrent Suggestion

Running through discussions on the new health service like a strand in a rope there is the recurrent suggestion that improved organization of medical care and the formation of regional boards will lead to better facilities for clinical research. One hopes this will be true, but there are reasons for not being too sanguine. There is an immediate danger that senior clinical research workers will be overwhelmed with administration and that juniors will be tempted away by the high salaries of young consultants. There will be obvious gains if notes are better codified and if we can register sickness as exactly as we can register the number of people in the country, their births, marriages, and deaths. The burden of filling in forms is so heavy, however, that I hope our statisticians will not try to do too much at once. A vast amount of time and labour can easily be spent on records, and research of this kind needs to be carefully planned and costed if it is to yield an adequate return. Democracy begins at the grass roots, and more willing co-operation will probably be obtained if the regions are given specific tasks, as in the notification of jaundice in Region IV during the war. This, however, is social medicine rather than clinical research in the ordinary sense.

There is likely to be increased concentration of cases in special centres, like the centres for head injuries, chest diseases, and gastric complaints which were started under the E.M.S. in the war. On a short-term basis this undoubtedly leads to technical advances, particularly when physicians and surgeons work together on common problems, but it is like farming for cash crops and the output soon seems to dwindle. Moreover, the advances are almost entirely technological and self-limited, unless the centres are designed as research units, as Colebrook's burns unit and some of the malaria research units were. Pupils of mine who have worked in units which were primarily designed for research on a single disease have nevertheless spoken of their anxiety to get back to general medicine after a time to refresh their minds. Special clinics for asthma, rheumatism, and anaemia tend to develop a routine, and research fades into the background. Just as the best farming is mixed farming, so the best clinical research is likely to be done in general hospitals, particularly those which are so fortunate as to be associated with university scientific departments. The chief stimulus to clinical research in the new health service will probably be the creation of more full-time specialists. Much has been done by such men under the old regime, as, for example, Avery Jones on gastro-duodenal ulceration, Banks on cerebrospinal fever, and Anderson and his colleagues on pneumonia.

How clinical research units or institutes should best be organized is still not settled. In university departments research must usually be combined with teaching. I have been convinced by my own experience, and that of other clinical researchers and whole-time teachers in this country and America, that it is not possible to research or teach on other people's patients and that whole-time academic workers and part-time consultants do not mix. I know that the rational answer is that the practising clinicians should "feed" the academicians, but owing to the loyalties and antagonisms which develop among groups of human beings this rational solution does not work. Whole-time and part-time clinicians are much better friends if they work in separate compartments. The clinical research workers must control their own group of patients. It is this necessity to combine research with the treatment of patients which differentiates clinical research from all other forms of medical research and poses problems to which there are as yet no generally accepted answers.

Size of the Research Unit

The first problem is how large a clinical research unit should be. Sir Thomas Lewis believed that the number of beds in a university department of medicine should be small—20 or 30. I worked for eight years with a department having only 21 beds, and I am sure Lewis was wrong. Lewis's own small research unit was superimposed on a much larger whole-time general medical unit, with which he worked in a particularly happy association. The total number of beds was in fact over 50. Lewis talked vaguely about a pool, but whereas one can pool ships and merchant seamen in wartime (even then there are complaints) one cannot shuttle patients about in this way. Our fellow-countrymen are sensible of the needs of clinical teaching and research, but they will not tolerate the conception of patients as clinical material which can be moved hither and thither at our convenience. The physician who is in practice acquires obligations to his patients and their general practitioners which make it hardly possible for him to hand them over to the care of another. Yet without complete control clinical research may be frustrated. On the other hand, the conclusion of any research project such as the study of special diets in hepatitis or the treatment of rheumatoid arthritis by the induction of jaundice leaves a responsibility for a large number of chronically ill patients which cannot be summarily abrogated. Just as the practising physician cannot hand over cases for research without qualms, so the clinical research worker cannot expect his colleagues to look after patients he has tired of. Finally, senior clinical research assistants must have the opportunity at times of exercising major clinical responsibility. If they do not, they will move at an early age to another post. Constant changes of staff on this account crippled the research of the London University professorial units in the inter-war years. In the language of the cinema, the professor was degraded from director to continuity girl. All this means that the unit must contain four or five times as many beds as are theoretically necessary for research.

Latterly I have been working with a total of 45 beds in two units, unfortunately geographically separate, of 21 and 24 beds respectively. The smaller unit has been used for acute illnesses, complicated cases, and clinical research. The larger unit has been used for routine work, for cases requiring protracted treatment, and for neurology. There has been little undergraduate teaching. These 45 beds, with their associated out-patient and follow-up clinics, have provided the background for a staff of six senior colleagues and a further six juniors of registrar status. With such a staff it is possible for all members of the department to have short periods of concentrated clinical work and longer periods when they have adequate leisure for research. No one is ever responsible for the supervision of more than 21 beds, but this is quite enough for one man to look after when investigation and research are being carried out at high pressure. We have plans for a unified department of 64 beds, and I believe that a unit of 50 to 100 beds, subdivided on functional lines and with a staff large enough to allow of alternation between research and routine clinical work, should provide the best solution of this difficult problem (Gardner and Witts, 1946).

The great danger in a unit of this size is the tendency to fritter. The world of medicine is so full of interesting and distracting things that we are tempted to diffuse our energies

over all of them instead of concentrating on one problem. It is this tendency which has made the words "clinical research" and "clinical pathology" an offence in the nostrils of the preclinicians, who regard us as expensive butterflies rather than worker bees. This is at bottom a difference of philosophies. One school teaches that every patient must be regarded as nature's experiment from which something new can be learned. All mysterious and bizarre cases, particularly if they affect the bones or the endocrines, are inevitably classified as professorial cases. The other school teaches that the clinical researcher must at all costs narrow his field of vision and draw an absolute distinction between research and the routine practice of medicine. I am sure that this is right. Once we give way to the temptation of following every interesting problem that presents itself at the bedside we shall be like the centipede counting its legs. In the ward one must constantly put a blind eye to the telescope. I am adamant on the rule that you can't research on all the diseases all the time.

Training

The next question is that of training. The key word in clinical research is clinical. The clinical scientist must be a properly trained clinician or no hospital committee will give him charge of beds. Nothing is more disastrous than for a man to take up clinical research and find himself in the thirties without a proper label, recognized neither as clinician nor as scientist. In the United Kingdom the clinical label is the M.R.C.P., preferably taken three years after qualification, after say two years in house appointments and a year working for the M.D. From the beginning, therefore, the clinical researcher is handicapped in comparison with the researcher in the basic sciences, who can begin a research career immediately after qualification. But a clinical training will not make a man a researcher —in fact, in some ways it unfits him by encouraging a superficial, know-all attitude. A man cannot get far in clinical research to-day without some special knowledge of experimental pathology or chemistry or physics or statistics. He must have another string to his bow. There is little doubt that at this stage of his career a man should spend a year in a non-clinical department, not merely to refresh his basic knowledge but even more to learn how problems can be isolated and how knowledge can be advanced by patient work and by learning to take one step after another. Technical equipment can be picked up by the way. What cannot be picked up is faith in the scientific method, in the value of experiment, in the ability to master technical procedures, in the necessity to concentrate on one purpose. All this is so different from the atmosphere of a busy ward, where many tasks must be carried out simultaneously and where judgments must be made and acted on immediately, that it is hard for a man to acquire a real faith in the scientific method without a period of isolation from patients.

Clinical research is inevitably a compromise between the desire to practise medicine and the desire to advance knowledge. As such it makes the clinical researcher suspect to the practising physician as well as to the pure scientist. With some of my colleagues it is an article of faith that a clinical scientist cannot be a good doctor. This is really a rather foolish controversy, but it is the sort of thing that happens when practising clinicians who are individualists work alongside clinical research workers who should be team-workers. I will merely turn the argument and say that the clinical scientist need have no false shame about asking for advice, whereas I have known honorary physicians who would have cut off their right hands rather than sign a request for consultation from a more expert colleague. The practising clinician should be superior in manual dexterity, though the clinical scientist can, if he wishes, concentrate on one technique or operation. The only charge which requires an answer is that the clinical scientist studies diseases while the practising clinician treats patients. If research should lead to neglect of the patient as an individual, then indeed the head of the department would be open to serious criticism. A genuine affection for patients is a prerequisite for a man in such a position.

Technical Problems

The technical problems of clinical research at the present time are those of research in general and of clinical research in particular. They depend partly on specialization of knowledge and partly on the need for workers, equipment, and buildings on a lavish scale. Within the narrow field of haematology there are now particular groups which talk a language that is almost incomprehensible to other haematologists. The workers on the rhesus factor, on blood coagulation, and on the macrocytic anaemias have each developed a body of data and hypotheses which needs a man's whole attention to keep up with. It is difficult if not impossible to make further progress in these subjects without a special knowledge of genetics, physics, or chemistry.

Here we meet one of the logical problems which face the clinical research worker who by luck or good management gets in on the ground floor, as it were, at the beginning of some new advance. Good examples in recent years are the effects of vitamin K and dicoumarol on blood coagulation, and the rhesus factor. As soon as a new idea like this is out of the bag the laboratories of the world, particularly its western hemisphere, are after it like a pack of hounds. The pace of advance is breath-taking. Pretty soon our clinical scientist must decide whether he is going to dedicate his life to a single pursuit, as Price-Jones dedicated himself to the measurement of red cell diameters and Ponder to their lysis, or whether he is going to remain the unspecialized researcher. This is a difficult and an individual decision. My own view is that just as the key word in clinical research is *clinical*, so the proper contribution of the clinical scientist is that of the holist. Once research gets down to fundamental problems of chemical structure or enzymology or radioactivity it is probably better handed over to people trained primarily in those subjects. At this level the clinical research worker may act as one member of a team, but he can rarely get far under his own power.

What is quite certain is that it is unwise for the man with a clinical training to start researching in a rapidly moving subject unless he really does get in on the ground floor. It is different, of course, if the entry to the subject is restricted by shortage of supplies, as in the case of penicillin and streptomycin, and he is one of the favoured ones who is asked for clinical trials. I have known a number of promising men who have had a good line of their own and yet have never been able to resist the fatal attraction of new discoveries and have fluttered off to them like moths to a candle. The usual result is a repetitive article in one of the journals, not infrequently there is a coldness on the part of the original discoverer, and sooner or later people, remembering his own particular subject, begin to ask, "I wonder why X never got on with so-and-so; he seemed to have the ball at his feet a few years ago."

The Law of Diminishing Returns

It is difficult to see any end to research in the basic sciences; certainly the sky is no longer the limit. The field of clinical observation, however, is subject to the law of diminishing returns. The descriptions of the signs,

symptoms, and morbid anatomical appearances of disease made in the first fifty years of the nineteenth century were more numerous and striking than those which have been made in the twentieth. Apart from coronary thrombosis and subarachnoid haemorrhage, it is difficult to think of any important diseases which have been discovered with the unaided senses at the bedside and the necropsy table in our generation. It is still possible to paint fresh pictures of disease in the tropics and in industry, but so far as ordinary clinical work is concerned the methods of Bright and Addison have yielded their harvest and only a few ears like temporal arteritis and bronchial adenoma remain for the gleaners. The recent advance has come from the application of the techniques of microbiology, chemistry, and physics. As a general rule it is unwise for the whole-time clinical research worker to take up projects which demand personal supervision of large numbers of patients. That kind of work is much better done by the full-time specialist (Avery Jones, 1948). Just as the full-time specialist cannot afford to get too far away from the bedside, so the academic physician or clinical scientist cannot afford to be too long away from the laboratory.

For clinical research to be profitable it must follow the sequence of observation, hypothesis, experiment. Experiment may be carried out in man or animals. The difference between the clinical scientist and the experimental pathologist in the use of animal experiment is hard to define, but it is nevertheless real. It depends on the fact that the clinical scientist is in close contact with patients and therefore tends to use animal experiment, and indeed all other scientific techniques, for the solution of immediate problems. Just as medicine is the mother of the sciences, so to-day those sciences are continually making fresh contributions to the support of medicine. There is a never-ending task in adapting new techniques and discoveries to the solution of clinical problems. The application of induced radioactivity and radar to the study of disease in man is the latest example of this process.

Experiment in Man

As new drugs are discovered they require trial in man, and the same applies to techniques as diverse as the punch card and the electro-encephalogram. Pharmacological experiment in man has given us new substitutes for morphine and new treatments for insomnia, epilepsy, and migraine. Similar studies may well lead us to the control of other common mental ills such as anxiety and impotence, depression and brooding. There is much to be done in psychiatry, genetics, social and industrial medicine, and demography. Many forms of rheumatism, and some aspects of the allergic and the psychosomatic diseases, can at present be studied only in the human subject. Our lack of progress in the control of these diseases and of mental disorders in general nevertheless emphasizes the difficulty of studying disease in man without the aid of animal experiment. How easy it is to aver that mental ideas or states can be converted into physical disease processes as they can be converted into phobias or hysterical paralyses, but how difficult it is to prove it or to demonstrate the mechanism! This is certainly a field which no one but the clinical researcher can enter at the present moment. The reason work has not got much beyond the descriptive or speculative stage is because of its extraordinary difficulty. Nevertheless, the work of Selye on the alarm reaction, Wolff and Wolf on pain, Lewis on urticaria, and Macfarlane on fibrinolysis does suggest some methods of attack.

Deliberate experiment in man is a relatively recent development, and I should like to say something about the ethical problem. I have had practical experience of therapeutic trials in pernicious anaemia, of exposure of human volunteers to T.N.T. and to mepacrine, and of the induction of infective hepatitis in man. Each of these experiences has occasionally caused the most lively apprehension. There is no evidence that anyone died or became permanently ill as a result of the numerous successful transmissions of jaundice to human volunteers during the war, yet this method of approach has for all intents and purposes been abandoned. It is not just that the volunteer is sometimes an unstable person who may swing violently from co-operation to antagonism: the plain fact is that few researchers would willingly inoculate themselves with jaundice, and it is an absolute rule of clinical research that one should never do to others what one would not do to oneself. Once break this rule and one is on the slippery slope that led so many Nazis to the abyss. Moreover, it is a moot point whether a healthy citizen is within his legal rights in volunteering for a dangerous experiment, any more than he has a right to bequeath his body. Certainly, the complications as regards inquests and sickness and life insurance are formidable. For all these reasons dangerous experiments on healthy researchers or volunteers are rarely wise in peacetime.

Therapeutic trials and investigations on sick people are on a different footing, for every treatment is an experiment and every potent remedy is dangerous. Nevertheless, here also one must stick to the rule of doing as one would be done by. All of us know surgeons, physicians, and investigators who have got a reputation for ruthlessness. This was never a good thing, and it is probable that it will be anathema in the new health service and under the present egalitarian regime. Even such relatively safe procedures as the deliberate provocation of attacks of angina or epilepsy, or the study of the failing heart by catheterization and angiography, have come in for lively criticism. The only justification for experiments on patients is that the information cannot be obtained from animals and that it is likely to be of benefit to the patient and his fellow-sufferers.

Mackenzie and Lewis both held that the study of symptoms in man would be as profitable as the study of physical signs and post-mortem appearances in the nineteenth century. So far it has proved unproductive. Indeed, I believe that they did English clinical science something of a disservice, and that the great weakness of our clinical research, in surgery even more than in medicine, is its failure to turn instinctively to animal experiment. The work of Himsworth on hepatitis or of my own co-workers on macrocytic anaemia is the type of procedure we should encourage. The problem, a clinical problem, arises in the ward and it is studied under simplified conditions in the experimental animal. Perhaps at this point I should confess my opinion that clinical science is essentially an applied science and therefore clinical research should be practical. Too great a concentration on the human subject leads to work which may be elegant but which gives a poor return for the talent and effort devoted to it. Much of the work which has been done on renal function and on the peripheral circulation in man seems to me to come into this category. One feels *a priori* that this is not the right approach to the prevention and treatment of nephritis or vascular disease.

The happy warrior, of course, is the man who, like Adrian, is equally at home with human or animal experiment and who uses each for the purpose for which it is most appropriate. So let me make it clear that I am not trying to advise the clinical researcher to work on animals rather than men, but that I am emphasizing the importance of the experimental method. In the address I have previously quoted, which was given on the foundation of the Nuffield

Clinical Chairs in Oxford, Flexner said that the key to achievement lies in the laboratory. It is not merely that the laboratory contains instruments of precision and that work can be carried out on animals; but the laboratory implies experiment. Above all, laboratory experiment means that fixed times and days are consecrated to research, and there is not the same danger of allowing research to be swamped by routine or to be relegated to the evening hours when the real work of the day has been done, as so often happens in clinical research.

Conclusion

The power to command one's time—that is the root of the matter. Unless clinical research is strongly buttressed by the laboratory and the experimental method it may be swept away and submerged by the oncoming tide of hospital organization. I am prepared to interpret the concept of the experimental method broadly, and I accept the view that there may be valuable psychological and sociological techniques which differ from the classical methods of experiment. All I wish to emphasize is the need of time and space for the pursuit of knowledge in the field of clinical medicine. The university clinical departments were diverted from research to teaching after the first world war, and there is a real risk that they may be diverted to regional organization after the second. If the new health service makes excessive demands on the universities for technical and administrative help clinical research will suffer. There are too many people in influential positions in this country who act as if they believe that clinical research is useful as an intelligence test to decide whether a man is energetic and clever enough to be appointed to a chair or the staff of a hospital, but that it should not engage his time thereafter. The fact that a single clinical scientist like Colebrook can do more for the relief of suffering in obstetrical and surgical emergencies than a hundred practising specialists or administrators makes little impression. What one misses in the United Kingdom, in contrast to the United States, is an abiding faith in clinical research as the most important business in which a hospital can be engaged. Until that belief becomes more widespread we may have an efficient apparatus for the treatment of disease by orthodox methods, but we shall never in the literal sense of the words have a health service.

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The Council of the Faculty of Ophthalmologists has reported that the Ophthalmic Subcommittee of the Negotiating Committee met representatives of the Ministry of Health on two occasions to consider the fees for the testing of sight under the Supplementary Service. As a result of these negotiations the Ministry agreed to the payment of £1 11s. 6d. per case, on the condition that the work would be carried out on premises and with equipment provided by the ophthalmic medical practitioner. The question of general-practitioner ophthalmologists caused some difficulty, and the fee was fixed on the understanding that not less than 95% of the work would be carried out by ophthalmologists of specialist status. The Ministry agreed that specialist status should include any doctor who held an ophthalmic diploma, even though he might be engaged in general practice. The remuneration of medical officers carrying out refractions in hospital has also been considered by the council, which has reiterated its opinion that the Supplementary Service should not be carried out in hospital, and has agreed that remuneration for refraction work in hospital should be on a sessional rate, based on the Spens Report. It has been decided to take the matter up with the Ministry of Health, together with various other points, including the establishment of the ophthalmic subcommittees of the regional boards, the position of the dispensing opticians in hospitals, and the employment of refracting opticians in hospitals.

MEDICAL RESEARCH IN THE LABORATORY

BY

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In attempting to present a picture of medical research in the laboratory as it is understood to-day it is very difficult to define the limits of the field. There was a time not so very long ago when an institute for laboratory medical research could be considered reasonably complete if there were adequate representation within it of pharmacology, pathology, and bacteriology. Now, on the other hand, we are approaching, if indeed we have not already reached, a state of affairs in which any sort of scientific discipline may be called upon to contribute to the solution of a medical problem.

The trend of development may be illustrated by what has happened at the National Institute for Medical Research. The Medical Research Council has always taken the broadest view of the range of activities which should be embraced by medical research. Nevertheless, when the National Institute for Medical Research was opened in 1920, with the avowed intention that it should house the principal scientific activities of the Council, only three groups of experimental laboratories were set up; these were laboratories for physiology and pharmacology, pathology and bacteriology, and applied physiology.

It is true that from the first the scope of the activities included under these headings was very wide; within the division of physiology and pharmacology, for instance, the work ranged from synthetic organic chemistry to pure physiology. Nevertheless, the picture was a very different one from that presented by the National Institute for Medical Research to-day, in which most branches of scientific work are represented and in which more and more importance is attached to those branches which at first sight have the least immediate contact with practical medicine.

The great developments which have taken place in the laboratory branches of medical research during the past thirty years, and which are reflected in the history of institutions such as the National Institute for Medical Research, are of course the result of development in branches of natural science other than those earlier recognized as being of direct importance to medicine, and of the growing realization of the closeness with which these other branches impinge upon medical and biological problems. It is within the period mentioned that biochemistry has emerged from its origin as a branch of physiology and has come to occupy its present status as an independent scientific discipline; it is also within this period, and particularly within the last few years of it, that the applications of various branches of physics to biological and medical research work have shown themselves to be of such outstanding importance.

It is notorious that the medical student often tends to doubt the importance and indeed the necessity for the instruction in the so-called basic sciences which he receives in the early part of his training. It remains difficult for the qualified medical man, unless he happens also to have been a serious student of some branch of science, to realize how closely dependent on scientific research work are the advances in practical medicine which are of immediate interest to him. It may therefore be worth while to reflect briefly on this question and to recall some examples of the way in which medicine is assisted by scientific work in the laboratory.

Searching for New Chemotherapeutic Agents

Sometimes of course the application of science to medicine is so obvious and direct that it requires no emphasis or explanation. The production by an organic chemist of a useful new drug or of a new chemotherapeutic remedy is immediately recognized as a valuable contribution. But let it be remembered that the idea leading up to the synthesis of the new drug may well have been developed from the results of prolonged pharmacological research, and that this research in its turn was based on knowledge derived from experimental work in pure physiology. Let it be remembered also that advances in chemotherapy, at least in so far as synthetic compounds are concerned, depend on the progress of the science of organic chemistry itself. Moreover, although a new chemotherapeutic discovery may often seem to be a matter of luck, the process by which it has been arrived at is in all probability not so empirical as at first appears. Use is made more and more by chemists engaged in chemotherapeutic research of the great body of knowledge that has been built up in the past, and of the generalizations relating chemical constitution to biological and chemotherapeutic activity which emerge from this knowledge.

In this connexion we may go a step further and remind ourselves that biochemistry has also its contribution to make to chemotherapy and pharmacology. The conception of specific inhibition of biological reactions was first evolved and illustrated by Quastel and his co-workers by studies of the biochemical properties of simple enzyme systems. Applied by Woods and Fildes to the metabolic processes of micro-organisms, this idea has formed the basis of a reasonable theory of chemotherapeutic action. It offers a satisfactory explanation of the mode of action of the sulphonamides, and it points the way to a systematic method of searching for new chemotherapeutic agents. The full potentialities of the theory of specific inhibition have not yet been realized; there can be little doubt, however, that this biochemical discovery will prove to be one of the most important bases of further advance in chemotherapy and indeed in many other branches of medical research.

Hormones, Vitamins, and Enzymes

In a similar way advances in endocrine therapy can be securely established only on a basis of biochemical investigation. Apart altogether from the obvious application of biochemical technique to the isolation of hormones in a state of purity, and the application of organic chemistry to the explanation of their chemical constitution and ultimately to their synthesis, theoretical biochemical considerations have led to many developments which would not otherwise have occurred. The discovery of the synthetic oestrogens, for example, which are of such therapeutic importance, had its origin in considerations of the relation of chemical structure to a certain type of biological action. The antithyroid drugs of the thiouracil type, which have revolutionized the medical treatment of hyperthyroidism, owe their discovery to the observation of a new type of goitrogenic action in experimental animals and to the skilful analysis of this observation on the basis of previously acquired physiological and biochemical knowledge.

Much the same considerations apply to work on vitamins. Whilst the existence of vitamins can be revealed and their general biological properties can be studied to a considerable extent by relatively simple methods, no real investigation of their mode of action in the body is possible until the pure substances are available, and they can only be made available by biochemical experiment. Moreover, the application of organic chemistry to the synthesis of vitamins, which has put them in the hands of physicians in large amounts, has proved to be of therapeutic importance in several instances where intensive administration of a single vitamin has been found useful.

A further illustration of the direct importance to medical research of fundamental biochemical work is to be found in recent studies of isolated enzyme systems. These studies have revealed hitherto unknown biochemical reactions such as transmethylation, and in doing so have explained the real reason for the long-known fact that certain amino-acids are essential, thus influencing dietetic theory and practice. They have produced much new knowledge of the chemical energetics of muscular contraction, on which must rest any satisfactory explanation of muscular fatigue. They are even approaching a demonstration of the interaction of hormones and enzymes which may lead not only to a great biological generalization but to much improved understanding of some types of metabolic disease.

In all these fields of biochemical work, therefore, investigations which are at first sight of purely academic interest prove not only to be essential to the proper and logical development of medical knowledge but are in reality quite closely connected with such development.

Proteins and Viruses

To turn to quite a different subject, one of the major advances of recent years on the physical side of biochemistry has been the development of methods of study of the physical properties of proteins. Outstanding among these advances have been the application of the ultra-centrifuge of Svedberg to the determination of molecular size and molecular weight of proteins, and the use of the quantitative electrophoretic methods of Tiselius to define their electro-chemical and other physical properties. Here again are two important pieces of scientific work which certainly do not appear to have much bearing on medicine. And yet it is largely on the information which has been gained by these techniques that the work of Cohn on the fractionation of blood proteins depends. The significance of this work for practical medicine needs no emphasis; one has only to think of its bearing on problems of blood transfusion and of the practical use that can be made of many of the separated proteins, such as the γ-globulin, which is a source of concentrated antibodies, and the fibrinogen, which, in the form of fibrin foam, provides a valuable haemostatic agent. Incidentally the very fact that the antibodies were to be looked for in a certain fraction of the serum globulins was discovered with the aid of the refined technique of electrophoresis.

The ultra-centrifuge has also found an important application in research work on viruses; its use has yielded valuable information in confirmation and extension of other physical methods, such as membrane filtration, concerning the size of different infective agents of this type.

Mention of viruses brings to mind another important development of physical technique—namely, the application of new optical methods and of the electron microscope to the study of microscopic and submicroscopic objects. Ultra-violet microscopy, which has been largely developed in direct connexion with medical research, offers a considerable extension to the range of the ordinary microscope, and recent research is making possible the use of ultra-violet microscopy for the examination of living material. Perhaps even more important for the study of living cells is the technique of phase contrast microscopy, which is now under active development, with its astonishing power of revealing fine structure. For the smallest objects of all we have the electron microscope with a resolving power of a different order from that of any optical method; the use of this instrument, employing the metal shadowing technique, combined with special methods of preparation of the

material to be examined, such as supersonic dispersal, is indeed placing the morphology of viruses on a new plane.

Isotopes

The physical technique which is attracting most attention at the present time in respect of its applications to medical and biological research is of course the use of isotopes, radioactive and stable; these isotopes form ideal indicators or tracers for following the course of biochemical reactions in the living body. In spite of the large amount of work on the subject which has been and is being published, the use of this technique in biology and medicine is really in its infancy. So far the tendency has been to use it for the obvious problems to which it gives an easy solution, in the natural desire to reap as large a harvest of results as possible in the minimum time. Even so a considerable amount of valuable information has been acquired; there can be little doubt that, as the newness of the method wears off and more serious thought is given to its potentialities, it will be more and more employed, as it ought to be, for the solution of problems which can be attacked by no other method with any reasonable prospect of success.

Other Branches

It may appear from what has been said so far that this article is heavily biased towards chemistry and physics, and that it is leading to the conclusion that all major advances in medical research in the laboratory are to be expected from the application of these two branches of science. Such a conclusion would of course be manifestly absurd, and no suggestion of the kind is intended. Great and important advances have also been made and continue to be made in the biological branches of laboratory research in medicine. We may think for instance of the development of the technique of tissue culture—a great discovery even if it has not yet yielded results of the importance that was first expected from it—and of new techniques such as the cultivation of viruses in developing eggs, which has been both of theoretical and practical importance.

Again, we may recall work in different branches of immunology; the prophylaxis of infective disease has been revolutionized by the laboratory research which led to the development of such immunizing agents as diphtheria and tetanus toxoids; the biological work which has been done in the laboratory on micro-organisms including viruses lies at the very root of problems of epidemiology; new knowledge of normal serological phenomena has been revealed, such as the existence of hitherto unrecognized blood groups, and in connexion particularly with the latter the importance of genetics in the natural history of disease has become more than ever manifest.

In pathology new knowledge has been obtained by experimental methods of the fundamental nature of the processes of inflammation as well as of the special pathology of many diseases. The scientific basis of pharmacology has been strengthened by the fundamental work which has been done on the mechanism of the transmission of nerve impulses. It would be possible to multiply instances of this kind, but it is surely unnecessary to say more in order to emphasize that the biological branches of medical research in the laboratory flourish and continue to play their full part.

Nevertheless there can be no doubt that the progress of biological work of all kinds is becoming more and more dependent on the techniques of chemistry and physics. Nor is it at all likely that this tendency, which is recognized by most biologists, will grow less. The experimental pathologist must not only have an understanding of the biochemical processes of normal tissues but he must be able himself to use, or to call in a collaborator to use, the appropriate biochemical technique to study the deviations of these processes. The bacteriologist must be acquainted with the biochemical make-up and behaviour of the organisms which he studies. The virus research worker will not get far unless he has at his disposal all the modern physical and optical methods for the study of small objects. The immunologist needs the help of the protein chemist in the interpretation of his serological observations and in the practical application of his results to the production of useful therapeutic sera or prophylactic agents. The biochemist and the endocrinologist need the support, on the one hand, of the organic chemist for the purification and the synthesis of the compounds which are important to them, and, on the other hand, of the physicist for techniques which will enable them to study the dynamics of processes as they actually occur in the living organism under normal and pathological conditions. In short, no worker in any branch of laboratory medical research can now be independent; on the contrary, as the whole subject becomes more complex and as its ramifications increase he must increasingly lean on his colleagues in all the other branches.

Some Pertinent Questions

If what has been said can be taken as giving a reasonable picture of medical research work in the laboratory as it is to-day, what are the implications? What are the probable developments? What opportunities does this type of work offer? Finally, what sort of men and women are needed to further its objects?

The first and fundamental point is that there is no place in a medical research laboratory for anyone who is not interested in scientific work for its own sake. It is true that the medical research worker cannot be as free from preoccupation with the ultimate practical outcome of his efforts as can the worker in a university scientific laboratory; on the other hand, it is disastrous for him always to be thinking in terms of immediate applications. Once a general line of work has been selected the method of attack should be as free as possible, and there should be no hesitation in starting far back in what appears to be the chain of events leading to the phenomenon which requires explanation.

At the same time, while real interest in scientific work is the primary qualification for a medical research worker, there is very little limitation of the range of scientific activity within the field as a whole. Enough has already been said to make it clear that it is difficult to find a branch of scientific effort which cannot in some way contribute to the solution of medical problems.

This means that medical research offers the widest possible opportunities, and that these opportunities are open to medical and non-medical men alike. At the present time, for instance, the scientific staff of the National Institute for Medical Research is largely composed of men and women not qualified in medicine, and many non-medical workers are engaged in medical research in the universities. Ideally it would clearly be better for all medical research workers to have the background of a medical education. In practice this object cannot be achieved so long as it remains unusual for medically qualified men and women to devote sufficient time to the study of a scientific subject such as chemistry or physics to be able to carry out serious research work in it.

The system which has been adopted for this reason, and which has been shown by experience to work reasonably well, can remain satisfactory only so long as the chemists, physicists, and non-medical biologists who are engaged in medical research remain in close contact with medical men, and so long as they will use this contact to acquaint themselves with the important problems and to learn to understand and appreciate the mode of thought of their medical colleagues. It is at the same time most desirable for the

furtherance of medical research in the laboratory that more medical men should choose to devote themselves to this branch of their profession.

It follows from what has been said that there is now little hope for success in medical research which is carried out in isolation. An almost essential condition is that such work should be done either in a university where good contacts are available with allied departments or in a research institute which is large enough to contain representatives of all the relevant branches of science. In this country this condition can now fortunately be fulfilled. The problems awaiting solution in the medical research laboratory are many and varied, and it is certain that no kind of work can bring greater intellectual satisfaction to those whose interest lies in science and who desire to help the advance of medicine.

THE STRUCTURE AND FUNCTIONS OF THE MEDICAL RESEARCH COUNCIL

BY

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This account of the Medical Research Council—the British Government organization for promoting medical research—has been prepared, by request, for the guidance of those undergraduate and postgraduate students in medicine and kindred subjects who may wish to consider a research career, or at least to undertake a period of research as an incident in the course of some other form of professional activity. Before discussing constitutional and administrative details it may be helpful to summarize the opportunities offered by the Council to the would-be research worker by indicating, first, the range of its interests and activities and, secondly, the forms of support to the individual worker which it is prepared to give in suitable cases.

In the first place it should be emphasized that, although research into the nature and causes of disease and into improved methods for its prevention, diagnosis, and treatment naturally forms an extremely important part of the Council's programme, that programme is of very much wider scope. It deals also with the fundamental sciences of medicine—physiology, biochemistry, biophysics, genetics, and the like; with problems of nutrition and of the maintenance of general human well-being, mental as well as physical; and with the normal and abnormal physiological and psychological reactions of the human being to his work and environment. It may deal, indeed, with almost any question involving the human factor.

The chief forms of support to individual workers provided by the Council are: (1) permanent or temporary staff appointments, (2) temporary research grants to independent investigators, (3) travelling and research fellowships, and (4) studentships for training in research methods. Each of these will be discussed under the appropriate heading below.

History and Constitution

The coming into force of the National Health Service Act, 1946, provides a not unsuitable occasion to review the history and constitution of the Medical Research Council, for the Council, as at present constituted, is the functional successor of the former Medical Research Committee, which was itself a child of the National Health Insurance Act of 1911. That Committee was appointed in 1913 under the National Health Insurance Joint Commission to administer funds provided for research into tuberculosis and other diseases affecting the insured population. It had scarcely had time to embark upon its programme, however, before the outbreak of the 1914–18 war caused it to divert most of its attention and resources to the study of problems of urgent military importance. Co-operating closely with the Army Medical Service, it was able to promote an active programme of studies on such diverse subjects as wound shock and wound infection, cerebrospinal fever, amoebic dysentery, and schistosomiasis, which gave many results of permanent value. That the activities of the present Medical Research Council during the second world war were even more varied and many times more extensive may be gathered from the Council's Report for the years 1939–45, which was reviewed in the *British Medical Journal* of May 15, 1948 (p. 942).

With the passage of the Act of 1919 which set up the Ministry of Health there was a fundamental change in the administrative arrangements for the promotion of British government-aided medical research, one of the provisions of the Act being to transfer responsibility for continuing the work of the Medical Research Committee to a specially appointed Committee of the Privy Council. In 1920, accordingly, the former Medical Research Committee was reconstituted as the Medical Research Council under the statutory authority of the new Committee of Privy Council for Medical Research; the Council was granted a Royal Charter of incorporation, and the funds for its work were thereafter provided direct by the Treasury in the form of a grant-in-aid approved yearly by Parliament—an arrangement which has persisted since. The Committee of Privy Council for Medical Research consists of the Lord President, as Chairman, and of the Ministers in charge of the principal State departments concerned with questions of public health in the United Kingdom and in the Empire overseas; the Minister of Health is its Vice-Chairman, and the Secretary of the Medical Research Council is *ex officio* its Secretary. The Lord President is the Minister responsible to Parliament for the Council's work.

It will be realized from what has been said that the Medical Research Council, although a Government organization financed from public funds, is not constitutionally a Government department. In fact, as will be shown later, it is a nearly autonomous body, predominantly of scientists, which enjoys full discretionary liberty in discharging its duties within wide terms of reference, its sphere of action in promoting medical research being unrestricted by rigid territorial or departmental limitations of function. The Council naturally maintains close touch with the several Government departments among which responsibility for public health is divided, and an important part of its programme consists in investigations of problems referred by the Ministry of Health and other departments for advice. It is able to collaborate freely on subjects of common interest with its sister research organizations—the Department of Scientific and Industrial Research and the Agricultural Research Council, both likewise under the Privy Council with the Lord President as their Minister. The Medical Research Council is also able to have direct relations with organizations in other countries having interests similar to its own—for instance, with the Rockefeller Foundation of New York, which has given much help to the Council's programme in many different ways over a long period of years. In administering the public funds entrusted to it the Council is not merely an advisory body but has full executive control.

Membership

There are nowadays twelve members of the Medical Research Council—three lay and nine scientific. They are appointed by the Committee of Privy Council for Medical

Research, and they retire in turn at regular intervals. Of those appointed for general rather than scientific qualifications one at least must be a member of the House of Lords and one a member of the House of Commons. The nine scientific members are chosen to represent different branches of curative and preventive medicine and the fundamental sciences on which these are based; they are appointed by the Privy Council Committee after consultation with the President of the Royal Society, as representing independent scientific opinion in the country, and with the existing Council.

Scientific members who have served for the normal period of four years are not eligible for immediate reappointment, but the aim is always to ensure that the Council's scientific membership comprises a body of distinguished experts with first-hand experience of research in clinical medicine and surgery and in the more important of the basic sciences, as well as in some of the specialties of medicine. The Council appoints its own Secretary and its other administrative and scientific staff. The present Secretary is Sir Edward Mellanby, G.B.E., K.C.B., F.R.S.

Advisory Committees

The fact that the individual scientific members serve for only a limited period helps to give the Council flexibility of outlook and provides a useful variation in the range of technical interests directly represented by its members. Nevertheless, it is clearly impossible for the nine scientific members at any given time to possess detailed comprehensive knowledge of all the increasingly complex and specialized branches of medicine and allied subjects. To counter this difficulty, and to advise it in promoting research in particular aspects of medical science, the Council is assisted by a large number of expert technical committees which it appoints for the purpose. The terms of reference of these different committees cover a very wide range of topics; some of them are standing committees which assist the Council in the promotion of long-term inquiries over an extensive field; others are appointed on a short-term basis to organize research on a single problem or group of problems and are discharged on the completion of that task. Examples of the former are the Accessory Food Factors Committee and the Chemotherapy Committee and of the latter the two committees set up in 1946 to direct clinical trials of streptomycin in tuberculous and non-tuberculous conditions, respectively.

Two standing committees of special interest at present are the Committee on the Medical and Biological Aspects of Nuclear Physics and the Colonial Medical Research Committee, the latter appointed jointly by the Council and the Colonial Office to direct work on nutritional and other questions affecting the well-being of colonial peoples, including, of course, the study of tropical diseases. In promoting research on problems of industrial welfare and efficiency the Council is advised by its Industrial Health Research Board and by special committees on Occupational Medicine, Occupational Physiology, Occupational Psychology, Industrial Pulmonary Disease, etc. Members of the Council's advisory committees serve in a voluntary capacity, without payment. The Council meets about nine times a year; its committees as often as necessary.

Finance

The funds available for the work of the original Medical Research Committee in the year 1914 amounted to about £55,000; the Parliamentary grant-in-aid of the Medical Research Council for 1948–9 is £770,000, and additional provision from public funds for special non-recurrent expenditure brings the Council's budget for this year to over £1,000,000. At the outbreak of the 1939–45 war the grant-in-aid was £195,000, and even by 1945–6 it had risen to only £295,000. The impressive increase in the size of the grant since then reflects not only the greatly increased cost of research but also a very wide extension of the Council's activities and commitments; for instance, the number of its research establishments was only sixteen in 1939; at present there are about forty. Important schemes of research now planned into some of the newer developments in radiotherapy for cancer—e.g., by the use of the synchrotron and cyclotron—must necessarily involve heavy non-recurrent expenditure on apparatus, for which Government authority has been obtained.

In augmentation of the public funds entrusted to it the Council is empowered by the terms of its Charter to accept charitable benefactions by gift or bequest for the support of medical research; some of these are used for the general programme, others are limited, by request of the donors, to work on specific subjects. The Council also from time to time receives grants from various public or semi-public bodies in aid of particular investigations. The cost of the Public Health Laboratory Service which the Council administers on behalf of the Ministry of Health (see below) is not a charge upon the research funds at its disposal but is provided separately.

Research Establishments

The Council's administrative headquarters are at 38, Old Queen Street, London, S.W.1, and its central research laboratories comprise the National Institute for Medical Research, at present situated at Hampstead, and associated farm laboratories at Mill Hill, a special building where there is also nutritional research. The Institute at Hampstead—a former hospital, opened for its present purpose in 1920—has become inadequate for growing needs, and it is hoped within the next two years to transfer its work to a new and much more commodious building on the Council's land at Mill Hill; this was begun shortly before the 1939–45 war and is now being completed and equipped. Only laboratory research is done at the National Institute, the Council's programme of clinical investigations being carried out at other centres, as will be shown later. Nevertheless, though much of the research work at the Institute is necessarily of a fundamental nature, a substantial part of it has an immediate bearing on clinical problems, and numerous field studies in hospitals and elsewhere have been organized from the Institute: an instance is the new attack launched in 1946 on the aetiology of the common cold, which is being carried out in a special unit at the Harvard Hospital, Salisbury, maintained jointly by the Council and the Ministry of Health.

The research programme of the National Institute is a very wide one, divisible into the broad categories of physiology, pathology (including bacteriology, protistology, virus diseases, and immunology), pharmacology, chemotherapy, biochemistry, endocrinology, and physics in relation to biological research. Diseases recently under intensive study there have included influenza, malaria, and, during the recent war, the typhus fevers. A special responsibility of the Institute is to maintain standard preparations for the biological assay of certain drugs, hormones, vitamin preparations, and antitoxins; this is done both in fulfilment of statutory obligations of the Council in the United Kingdom and, in many instances, on behalf of the World Health Organization (formerly the Health Organization of the League of Nations). Sir Henry Dale, O.M., G.B.E., F.R.S., was the first Director of the Institute; he was succeeded, on his retirement in 1942, by Dr. C. R. Harington, F.R.S. (now Sir Charles Harington).

It is obvious that in any comprehensive programme of medical research prominence must be given to the study

of problems of disease and injury as they are seen in patients—that is, to clinical investigations in hospital wards and out-patient departments. The Council has not established a special research hospital, deeming it preferable to take advantage of the available facilities and freer supply of clinical material at existing hospitals and the valuable opportunities to recruit and train new investigators which are provided by the day-to-day contact of research workers with undergraduate and postgraduate students at academic centres. In conformity with this policy it has for long maintained, wholly or in part, special units for clinical research at two London teaching hospitals and at the National Hospital for Nervous Diseases, Queen Square, London, W.C.1. The oldest of these establishments is the Department for Clinical Research at University College Hospital, and it was here that the late Sir Thomas Lewis, F.R.S., carried out much of his famous work on diseases of the heart and blood vessels.

It has already been mentioned that the expansion of the Council's programme since the beginning of the recent war has led to a great increase in the number of its special research units. Many of these newer units have also been established primarily to study clinical problems; they include the Otological Research Unit at the National Hospital for Nervous Diseases, the Radiotherapeutic Research Unit at the Hammersmith Hospital, the Department for Research in Industrial Medicine at the London Hospital, the Industrial Medicine and Burns Research Units at the Birmingham Accident Hospital, the Pneumoconiosis Research Unit at Cardiff, the Department of Experimental Medicine at Cambridge, and the Clinical Chemotherapeutic and Clinical Endocrinology Research Units at Glasgow and Edinburgh, respectively. A Table listing the Council's chief existing research establishments other than the National Institute for Medical Research, at Hampstead, is given below.

The arrangement between the Council and the institution housing a particular research establishment varies from case to case, but the Council usually provides the medical and other scientific workers and the research expenses, the institution supplying accommodation and, in the case of the clinical units, the cost of feeding and nursing the patients. A statistical research unit has been an essential part of the Council's organization from the beginning of its work; the unit is housed in the Department of Medical Statistics at the London School of Hygiene and Tropical Medicine, the head of the Department, Professor A. Bradford Hill, himself giving part-time service to the Council.

Work Overseas

As an important ancillary to its programme within the United Kingdom the Council during the recent war dispatched a number of field research teams overseas to carry out intensive investigations of health problems affecting the armed Forces or the civilian populations of colonial territories. Before the war it had co-operated with other bodies in arranging a nutritional survey of Nyasaland, and it had awarded a number of fellowships to enable suitably qualified workers to undertake periods of field research on tropical diseases in various colonies. This type of collaboration with the Colonial Office has been greatly facilitated by the appointment of the joint Colonial Medical Research Committee, and by the setting up in 1944 of the Council's Human Nutrition Research Unit (see Table). Since then a number of members of the Unit and other workers for the Council have been sent to investigate health problems in overseas territories. An outstanding development of this kind has been the establishment in the Gambia of a Field Research Station with clinical facilities; this, though supported from colonial development funds, is run in direct association with the Human Nutrition Research Unit in London, both being directed by Professor B. S. Platt, of the Council's staff.

Another overseas activity of the Council, also relating mainly to nutritional questions, was the formation of a temporary research unit at Wuppertal, as an annexe to the Department of Experimental Medicine at Cambridge under Professor R. A. McCance; its primary object was to study the effects and treatment of post-war malnutrition in the German population. A research mission of a different kind has been that sent by the Council to Cairo, by arrangement with the Egyptian Government, to investigate problems of schistosomiasis in areas where the disease is endemic.

Research Staff

At the National Institute for Medical Research, at all the research centres listed in the Table, and at many others the Council employs a whole-time scientific staff, appointed on either a permanent or a temporary basis. There are at present about 300 members of the scientific staff, exclusive of technical assistants. Pensions for staff members on retirement are provided by insurance policies under the Federated Superannuation System for Universities.

In addition to those working in the Council's own research units, some members of the staff are attached to hospitals, university departments, or other independent research centres. Among the fields of study of these "external" members of the staff are problems of disease in children, nutrition, clinical bacteriology, tuberculosis, chemotherapy, and the biological effects of radiation.

Research Grants

Although the greater part of the funds at the Council's disposal is devoted to the support of research by its own staff, an important fraction has always been expended annually in the form of temporary grants made in aid of approved researches by entirely independent investigators at universities, hospitals, and other institutions throughout the United Kingdom and, on occasion, overseas. These grants may be made variously for the personal support of the investigator on a whole-time or part-time footing, for the provision of scientific or technical assistance to senior investigators, or for research expenses. Grants made by the Council are usually awarded on an annual basis, and those made to workers for their personal support are not ordinarily renewable over a longer total period than three years. Where an application for a research grant comes within the field of interest of one of the Council's many expert committees the Council has the advice of the committee in considering it.

Studentships and Fellowships

Reference has been made above to the advantages, from the point of view of the recruitment and training of new research workers in medical science, which are gained by the siting of most of the Council's clinical and other research establishments in teaching centres. As a further aid to recruitment the Council awards studentships for training in research methods to young graduates of special promise who are recommended for the purpose by the heads of the departments in which the training would be given. These studentships are tenable for a period of one year in the first instance, and are renewable up to a maximum of three years in all, subject to favourable reports from the supervisors of the studies; one of their chief objects is to make it possible for young men and women who otherwise might be prevented by economic factors from contemplating a research career to display their fitness for that type of work.

Apart from these training studentships, which are tenable in the United Kingdom, the Council awards certain travelling fellowships to enable suitably qualified British workers to undertake periods of study and research at centres abroad. It has for long acted as the agent in Great Britain of the Rockefeller Foundation of New York by awarding the travelling medical fellowships for British workers generously provided by that body, and it has its own series of travelling and research fellowships in tuberculosis financed from a special benefaction in memory of Dorothy Temple Cross.

Table showing Principal Research Establishments of the Medical Research Council other than the National Institute for Medical Research (July, 1948)

Subject	Establishment	Place	Present Director of Unit or Department or Head of Research Group
General medicine	Department of Clinical Research	University College Hospital, London	E. E. Pochin, M.D., F.R.C.P. (post endowed by Rockefeller Foundation)
" "	Clinical Research Unit	Guy's Hospital, London	R. T. Grant, O.B.E., M.D., M.C.R.P., F.R.S.
Medicine (including nutritional and paediatric studies)	Department of Experimental Medicine	Cambridge University (with temporary field-research unit at Wuppertal, Germany)	Prof. R. A. McCance, Ph.D., M.D., F.R.C.P., F.R.S.
Diseases of the nervous system	Neurological Research Unit	National Hospital, Queen Square, London	E. A. Carmichael, C.B.E., M.B., F.R.C.P.
Problems of ear disease and deafness	Otological Research Unit	National Hospital, Queen Square, London	C. S. Hallpike, M.B., F.R.C.P., F.R.C.S.
Problems of vision	Vision Research Unit	Central London Ophthalmic Institute, Judd Street, W.C.1	H. Hartridge, M.D., F.R.S.
Treatment of cancer	Radiotherapeutic Research Unit	Hammersmith Hospital, London	Miss C. A. P. Wood, M.R.C.P. D.M.R.E. (half-time)
Industrial diseases and poisoning	Department for Research in Industrial Medicine	London Hospital	Donald Hunter, M.D., F.R.C.P. (part-time)
Industrial health hazards, including injuries and skin diseases	Industrial Medicine Research Unit	Birmingham Accident Hospital	J. R. Squire, M.B., M.R.C.P.
Treatment of burns	Burns Research Unit	Birmingham Accident Hospital	" "
Industrial pulmonary disease	Pneumoconiosis Research Unit	Llandough Hospital and other centres, Cardiff	C. M. Fletcher, M.D., F.R.C.P.
Actions of drugs in man	Clinical Chemotherapeutic Research Unit	Glasgow University and Killearn Hospital	J. Reid, M.D., M.R.C.P. (part-time)
Clinical aspects of endocrinology	Clinical Endocrinology Research Unit	Edinburgh University and Royal Infirmary	(At present directed by a Committee)
Nutrition	Nutrition Building	Mill Hill, London	Sir Edward Mellanby, G.B.E., K.C.B., M.D., Sc.D., F.R.C.P., F.R.S.
"	Human Nutrition Research Unit	National Hospital, Queen Square, London, and London School of Hygiene and Tropical Medicine (with associated establishment in the Gambia)	Prof. B. S. Platt, C.M.G., M.B., Ph.D.
Nutrition (vitamin studies)	Group for Research on Nutrition	Lister Institute of Preventive Medicine, London	S. S. Zilva, D.Sc., Ph.D., F.R.I.C.
" (mainly vitamin studies)	Dunn Nutritional Laboratory	Cambridge University	L. J. Harris, Sc.D., Ph.D., F.R.I.C.
Dental disease	Dental Research Unit	King's College Hospital, London	J. D. King, Ph.D., L.D.S.
Bacterial chemistry	Bacterial Chemistry Research Unit	Lister Institute of Preventive Medicine, London	Sir Paul Fildes, O.B.E., M.B., F.R.S.
" "	Group for Research in Chemical Microbiology	School of Biochemistry, Cambridge University	Miss M. Stephenson, Sc.D., F.R.S.
Cell metabolism	Cell Metabolism Research Unit	Sheffield University	Prof. H. A. Krebs, M.D., F.R.S. (part-time)
Problems of blood grouping	Blood Group Research Unit	Lister Institute of Preventive Medicine, London	R. R. Race, Ph.D., M.R.C.S.
Preparation of blood derivatives	Blood Products Research Unit	Lister Institute of Preventive Medicine, London	A. N. Drury, C.B.E., M.D., F.R.S. (Hon. Director)
Problems of transfusion	Blood Transfusion Research Unit	Postgraduate Medical School of London	P. L. Mollison, M.D., M.R.C.P.
Chemotherapy of malaria	Group for Research in Chemotherapy	Molteno Institute, Cambridge University	Miss A. Bishop, Sc.D.
Toxicology (with special reference to industry)	Toxicology Research Unit	Chemical Defence Experimental Station, Porton	J. M. Barnes, M.B.
Electromedical studies	Electromedical Research Unit	Ministry of Pensions Hospital, Stoke Mandeville, Bucks	R. B. Bourdillon, C.B.E., *M.C.*, A.F.C., D.M.
Biophysics	Biophysics Research Unit	King's College, London	Prof. J. T. Randall, D.Sc., F.R.S. (Hon. Director)
Medical problems of nuclear physics (including research on health hazards)	Radiobiological Research Unit	Atomic Energy Research Establishment, Harwell	J. F. Loutit, D.M., M.R.C.P.
Molecular structure of biological systems	Unit for Research on the Molecular Structure of Biological Systems	Cavendish Laboratory, Cambridge University	M. F. Perutz, Ph.D.
Environmental physiology	Groups for Research in Industrial Physiology	London School of Hygiene and Tropical Medicine	(1) T. Bedford, D.Sc., Ph.D. (2) H. C. Weston, F.I.E.S.
" "	Research Unit on Climate and Working Efficiency	Oxford University	Prof. W. E. Le Gros Clark, D.Sc., F.R.C.S., F.R.S. (Hon. Director)
Occupational psychology	Applied Psychology Research Unit	Cambridge University	Prof. Sir Frederic Bartlett, C.B.E., M.A., F.R.S. (Hon. Director)
" "	Group for Research in Industrial Psychology	Manchester and elsewhere	S. Wyatt, D.Sc.
Psychological and other "human" problems of the building industry	Group for Research on the Building Industry	Birkbeck College, London	Prof. C. A. Mace, M.A., D.Litt. (Hon. Director)
Occupational psychiatry	Occupational Psychiatry Research Unit	Institute of Psychiatry, Maudsley Hospital, London	Prof. Aubrey J. Lewis, M.D., F.R.C.P. (Hon. Director)
Medical statistics	Statistical Research Unit	London School of Hygiene and Tropical Medicine	Prof. A. Bradford Hill, D.Sc., Ph.D. (part-time)
Social medicine	Social Medicine Research Unit	Central Middlesex County Hospital	J. N. Morris, M.R.C.P., D.P.H., D.C.H.

Publications

Before the war the Council had to submit to Parliament an *Annual Report* on its work, which was published; the latest of these Reports to be issued was that for 1938–9, but the series has been resumed with a six-year Report reviewing the Council's many activities during the war period, which was published a few months ago. Best known among the Council's several other series of publications are the green-covered *Special Reports*, of which more than 260 have been issued, on a diversity of medical subjects. Others deserving special mention are the white *Memoranda*, started in 1940 as *War Memoranda*, which are used to record the results of certain *ad hoc* investigations or to give up-to-date advice on practical problems of medicine based on the latest results of research. All the Council's own publications are printed and sold by His Majesty's Stationery Office. The results of the great majority of the investigations supported by the Council are, however, reported direct by the

workers concerned in papers contributed on their own initiative to medical and other scientific journals.

The Public Health Laboratory Service

Reference has already been made to the Public Health Laboratory Service, organized and administered by the Council for the Ministry of Health since 1939. An account of the history of the Service and of its work to date was given by Dr. G. S. Wilson, the Director, in his Milroy Lectures published in the *British Medical Journal* of April 3 and 10, 1948 (pp. 627 and 677). The original object of the Service was to augment the existing public health resources of the country in combating epidemics of infectious disease such as were likely to arise from the abnormal conditions of war, and to keep a constant watch for any suspected instance of "bacterial sabotage." While the Service did not, in the event, have any example of "bacterial sabotage" to contend with, it proved so notably successful in elucidating and restricting outbreaks of infectious disease and bacterial food-poisoning during the war that it has been extended since as the framework of an organization for carrying out nation-wide investigations of problems of public health and epidemiology. At the request of the Government the Council accordingly agreed to administer the peacetime Public Health Laboratory Service on behalf of the Ministry for an initial period of five years. Statutory authority for the Service is provided in the National Health Service Act of 1946.

Discussion

It is often asked: is enough money provided in this country for the needs of medical research? It would be both unwise and untruthful to answer that question in the affirmative, for it is certain that additional funds could always be effectively used to assist research on important health problems to which new clues may have been provided by recent discoveries and for which suitably trained investigators with good ideas and good facilities are available. On the other hand it would be wrong to suggest that the present Government and its predecessors have failed to meet the requests of the Medical Research Council for increased funds for the support even of very costly new work which the Council believes to be necessary and promising.

It is important to remember, moreover, that the grants-in-aid provided by Government for the work of the Medical Research Council comprise only part of the financial support available in the United Kingdom for the encouragement of medical research; there are, in addition, the very substantial resources of the universities and hospitals and of various independent foundations and institutions; of the latter the Nuffield Foundation, the Wellcome Foundation, the British Empire Cancer Campaign, and the Imperial Cancer Research Fund are four examples among many of different kinds. The promotion of medical research in Britain, therefore, is not a monopoly, and both State and private enterprise contribute largely to it. The Council by its constitution is able to collaborate at will with any other official or private body having similar objectives, and a not unimportant part of its function is to decide whether a given investigation proposed to it would be better supported by itself or by some other organization with a view to avoiding undesirable duplication of effort.

The popular belief that a solution to even the toughest disease problem could probably be obtained at short notice by suddenly diverting to it huge sums of money and large numbers of investigators at a time when its prevalence gives it prominence in the newspapers unfortunately has little foundation in experience. This million-pound-in-the-slot-machine principle very rarely applies in medical science. Time and again it has happened, instead, that control of a particular disease has been gained not by the method of intensive direct attack but as an unexpected result of patient fundamental advances on a much broader front and often involving an entirely different research discipline. Consider, for example, the recent studies of antibiotics, which have made possible the successful treatment of a large number of infections that had stubbornly resisted direct attack upon themselves as single diseases. It is for this reason that benefactions for medical research are often more effective when they are available for use in any part of the medical field which expert opinion deems ripe for exploitation than when they are rigidly dedicated to research on one subject, though cancer research and tuberculosis research, with their manifold problems, are obvious exceptions to the generalization.

Experience has shown that once a really hopeful new approach to a problem has been opened, and the right men or women with the right ideas are available to follow it up, the necessary money to support their activities will generally be forthcoming either from public or private sources. It is the need to find a new approach rather than just to spend more money which too often limits the speed of progress.

In an article published elsewhere[1] I discuss some of the reasons why medical research must generally be opportunist and can rarely be subject to long-term "planning" save in very broad outline (as by the appointment of a research establishment under a suitable director who is given a wide mandate within which to develop the details of his programme). Sir Edward Mellanby made nearly the same point some years ago when he remarked that the policy of the Medical Research Council was "to have no policy but to find the right men and back them in every way possible." The setting up of the Council's research establishments has largely to be governed by this opportunist philosophy—it is a question not only of realizing the kinds of problem urgently needing to be solved but also of finding men or women with the right sort of outlook, imagination, and experience, and of choosing centres with the best available facilities for their studies. Not infrequently the proposal to set up a new establishment has been put up to the Council by the investigator who subsequently has been made director of the unit concerned, though in other cases the Council has taken the initiative in starting a unit under a director considered to be suitable.

Large as is the number of the Council's research establishments at present, a glance at the Table will suffice to show that they do not as yet by any means cover the whole vast field of medical science. More units are being set up as opportunity offers, and the number of members of the Council's research staff increases each year. To meet the growing needs of the future there will be a call for more and more trained investigators in medicine and the allied sciences, and I have tried to indicate the range of opportunities which the Medical Research Council offers for such training to persons with a bent for discovery. The remarkable recent advances in so many different parts of the field have made the prospects for medical research more hopeful now than at any previous time: the demand for new recruits to the skilled army of investigators is correspondingly great.

[1] *Brit. med. Bull.*, 1948, **5**, 352.

The average annual production of quinine in India in the last three years was about 85,000 lb. per year. Approximately 145,000 lb. of quinine were imported into India during the last two years. There is at present a central stock of about 120,000 lb. of quinine and the question of maintaining an adequate reserve is being borne in mind. The existing cinchona plantations in India are owned mainly by the Governments of West Bengal and Madras, and they are making every effort to maintain and increase production.

THE STATISTICIAN AND MEDICAL RESEARCH

BY

MAJOR GREENWOOD, D.Sc., F.R.C.P., F.R.S.

Professor Emeritus of Epidemiology and Vital Statistics in the University of London

Statistics is—or are—an old science (or art), but Francis Galton, Karl Pearson, and W. F. R. Weldon discovered a new application of statistical method at the end of the nineteenth century, and in 1902 the biometricians, as they were called, established a journal of their own, *Biometrika*, now in its 35th volume. The first volume of *Biometrika* contains a paper of medical interest—on the influence of previous vaccination in cases of smallpox—and others followed. For some years, however, the influence of the new race of statisticians on the logical procedures of either pathologists or clinicians was small and largely confined to destructive criticism. Biometrician A.B.—the actual letters were usually K.P.—would fall upon a paper by Dr. C.D. and show that Dr. C.D.'s conclusion that treatment X gave better results than treatment Y did not follow from his data, that there was no significant (then and now a terribly overworked word) difference between the means of his two series. Even when, as sometimes happened, the difference was significant, A.B. would argue that other differences between the two series than the method of treatment might account for the result.

At first both laboratory workers and clinicians simply ignored the biometricians or called them mere mathematicians, often thought by clinicians and some biologists, like Almroth Wright, to be an inferior race of mankind. As J. J. Thomson once said, if ignorance of mathematics is a virtue it is surely the easiest of virtues. However, the tide turned; in 1910 the Lister Institute appointed a medical statistician and the Medical Research Committee (now Council) appointed another in 1914. Many statisticians now well known would acknowledge how much they owe to the friendship and encouragement of Sir Charles Martin or Sir Walter Fletcher which brought them through times of depression and frustration.

The widespread activities of the Medical Research Council and of an associated research committee, now the Industrial Health Research Board, led to increasing utilization of statistical methods, even in clinical research. In 1921 a statistical research committee was formed to take part in the planning and control of industrial-medical inquiries. Four years later this committee's terms of reference were extended and it became the statistical committee of the Medical Research Council itself. In the succeeding 14 years this committee had a large part in bringing statistical methods to bear upon laboratory researches as well as upon those field or factory inquiries which admittedly involved statistical analysis.

Contemporaneously, new statistical methods were used in non-medical laboratory and field biology. Progress in this way in agricultural research was particularly great, because one of the most gifted of contemporary statisticians, Professor R. A. Fisher, was for several years head of the statistical department of the Rothamsted Experimental Station. His epoch-making additions to statistical technique, applicable far beyond the bounds of soil research, were naturally first used in agricultural trials.

Now the biometricians have triumphed; indeed, some people may be reminded of Macaulay's rhetoric, that the whigs endured everything that O'Connell should not "be less than a British subject. We never will suffer him to be more."

Demand for Statisticians

One may say, broadly, that the demand for statisticians has increased for two reasons. The first is that statistical methods have become far more exact and searching—i.e., capable of reaching results in fields which even so recently as 50 years ago seemed closed to them. The next is that experiments are expensive in money and time; we want results as cheaply as possible and as quickly as possible. It is therefore important to squeeze the last drop of information out of an experiment—i.e., to plan it properly and to analyse the data in the most efficient way. Suppose the experiment is a clinical one, that we desire to test the values of two treatments—A and B. I think, before Professor Fisher taught us better, that we should have looked at it in the following way. If we had available, say, 120 patients we should give A to 40, B to 40, and leave another 40 untreated.

Our 120 patients are not test-tubes, they differ in many ways; some of these differences may be relevant to the success of treatment, hence one must have a technique for the assignment of patients to each of the three groups which does not weight one group unfairly with persons likely to respond more (or less) favourably than others to treatment. But a statistician would not now recommend three groups of 40, unless remedies A and B were known to be incompatible. If, for example, the treatments were two *different* techniques for removing a new growth, clearly to give a group of patients both treatments is nonsensical. But often A and B can be combined; if therefore we had four sets of three: (1) AB, (2) A, (3) B, (4) neither, and assigned 30 patients to each, then not only should we be able to test whether the combination of A with B were better than either, which the "pure" experiment did not permit, but we have lost nothing in stringency of comparison of single treatments, for we can not only compare A against the "pure" controls but AB against B, if we wish to assess the value of A alone. This is a simple example of the economy of factorial design, and illustrates the fallacy of isolating factors, a doctrine which, as Professor R. A. Fisher remarked, "seems to be more nearly related to expositions of elementary physical theory than to laboratory practice in any branch of research."

The New Method

An example of the power of statistical methods in medical research is the assaying of drugs by biological tests. Up to comparatively recent times laboratory workers were apt to look on mice or guinea-pigs just as test-tubes of different sizes and ages. I think the first worker in England to allow statistically for the fact that, just as mice individually vary in weight, appetite, and temper, they vary in response to doses of toxins or drugs, was J. W. Trevan, who published an important paper in 1927. In 1933 J. H. Gaddum's Report to the Medical Research Council extended the new method, and between 1937 and 1943 J. O. Irwin, of the Medical Research Council's statistical staff, published several valuable papers. In America, from 1934 onwards, C. I. Bliss and his colleagues did much research into the theory and practice of the method.

D. J. Finney's recent book (*Probit Analysis*, Cambridge University Press, 1947) gives a clear account of this new and valuable technique. The fundamental idea is simple enough. We are interested in a drug which can be tested only by administering doses of it to samples of mice and noting how many die at each dosage. Common sense dictates the drawing of a graph of the percentages which die at each dosage plotted as ordinates against the dose, or some function of the dose, as abscissa. But we must take account of the variability of response and remember

that even if we use equal numbers of mice at each dosage the points on the graph are not equally well determined, because, for statistical reasons, the precision of the ordinate for 50% fatalities will be greater than for 10% or 90%. Trevan noted that taking for abscissae the logarithms of the doses gave better results than using the actual doses, and a further transformation reduced the problem to the fitting of a straight line; now, very efficient routine methods of assay are available. But to reach this has involved a good deal of mathematical-statistical analysis.

Lastly, statistical methods play an important part in applied psychology. The pioneer was Charles Spearman, who concluded that scores in intellectual tests—for instance, examination marks in French or chemistry—could be expressed in terms of two "factors"—a general factor measuring something common to all cognitive activities and a special factor peculiar to each activity. Later research has shown the problem to be more complex than it first seemed to be, but psychological testing has grown and extended from the cognitive to the conative aspects of the mind and therefore interests psychiatrists and medical psychologists as well as schoolmasters and Civil Service examiners. Sir Cyril Burt's treatise, *The Factors of the Mind* (University of London Press, Ltd., London, 1940), gives a critical review of what is now called "factor-analysis." Here again the construction of an adequate arithmetical routine involved a good deal of difficult mathematical analysis.

I have said nothing of the importance of the simple statistical methods, already understood well enough 50 years ago, in clinical medicine. Professor J. A. Ryle in his recent book (see *Changing Disciplines*, particularly p. 104 *et seq.*, Oxford Medical Publications, 1948) has spoken of this with a clinical authority I lack.

B.M.A. Committee's Report

Perhaps the reader is satisfied of the importance of statistical methods in all medical research, and he is sure to know that in the present undergraduate medical curriculum statistics, like liturgiology, civil engineering, or the use of the globes, has no place at all. Even from the professional point of view this is a pity; my quotation from Macaulay's speech was not made at random. The medically trained person, whether laboratory worker or clinician, can no longer afford to despise the statistician, who for many years to come will *not* be medically qualified. He must accept him as a colleague, and unless the "doctor" does have some knowledge of the elements of statistical method the colleague will become, in the eyes of the world—which is becoming statistical-minded—not the colleague but the leader. Yet, down to the publication of the B.M.A. Curriculum Committee's report on *The Training of a Doctor* (Butterworth's Medical Publications, 1948), no authoritative body has faced the position.

This report differs from those published by the Stationery Office during the war on educational problems, medical or general, in two respects; it is written in the English language, not in jargon, and can be read with pleasure because it develops a plan logically and artistically. The committee thinks that statistical method should have a place in the first year of medical study because statistical ideas have their part in shaping current views of the fundamental sciences—namely, physics, biology, and chemistry—it recommends a course of 10 lectures, with practical work, and sets out a very reasonable syllabus. The whole of the committee's remarks (paras. 86–91 on pp. 28–9) seem to me excellent. If I criticize the proposal it is not from lack of sympathy with the enlightened spirit which inspired it. A class of first-year medical students will consist of young men and women who for the most part have learned *and remembered* little more mathematics than what is covered by the ordinary school-leaving certificate; indeed, if some medical faculty boards have their way, and medical students are not required to take mathematics even up to this standard, the average mathematical level of the class may be even lower. It is quite true that the principles of statistical method can be taught, and efficiently taught, without any more technical knowledge of algebra than many of the class will have or could quickly acquire. But that requires more time and a far more efficient and experienced teacher than the instruction of pupils with a serious mathematical background.

I do not think formal lectures should bulk in the course of instruction. No doubt an introductory lecture might rouse the enthusiasm of the class, be good propaganda, if the teacher had the gift of persuasiveness; it might, however, be merely dull. I should say that the best way of teaching is informal; one should try to combine a demonstration with a practical class. The teacher might, for example, give a short talk, say 10 minutes, on the advantages and disadvantages of common averages, the mean, the median, and the mode, and how these are computed. The class should then follow the heuristic method of Mr. Squeers and at once work out examples for themselves. As every experienced speaker or teacher knows, "impromptu" speaking and "informal" teaching require much more preparation than a set speech or formal lecture. In our particular case, worked examples and instructions to students can be mimeographed and distributed, but the difficulties many intelligent people have with "sums" are infinite, and the teacher must have had a good deal of experience to be able to remove or alleviate the student's perplexities. I am a pure Cockney, and my experience as student and teacher is wholly confined to London. In London there are not now enough teachers of the necessary powers to go round the medical schools. This might not be an unmixed evil. Although a statistical laboratory is not so expensive to equip as a physiological laboratory, aids to computation, such as calculating machines, cost a good deal of money. To confine practical work in statistics to what can be done by brute force and a table of logarithms would be as wise (or as foolish) as to restrict experimental physiology to what could be done on oneself—or a fellow student—with one's wits and ten fingers. Two or three equipped departments might receive all the medical students in London, in a regular rotation so that the classes were small.

But unless the committee can persuade members of the faculty board and of the boards of studies within the faculty of medicine that statistics is not an elegant extra but a fundamental discipline, not indeed demanding as much time as chemistry, physics, and biology, but still fundamental, its plan will not succeed. Nobody dislikes examinations more than I do, but unless "human nature" has changed a great deal in the last 50 years—perhaps it has—the average student will not take much trouble over subjects unremunerative in marks. I hope the committee will succeed; all its members are clinicians and, for sound psychological reasons, their opinions are weighty. I think *I* should find it as difficult to persuade the board of the faculty of medicine to take the committee's plan seriously as a cobbler would find it to persuade me to double my expenditure on boots.

During 1947, 60% of fatal accidents and 38% of all accidents on building work reported to the Factory Inspectorate were on jobs not governed by the existing regulations for the safety and welfare of the workers. The Minister of Labour has therefore made new regulations under the Factories Act, 1937, to cover such cases.

RESEARCH IN GENERAL PRACTICE

BY

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"I shall never have smallpox. I shall never have an ugly pockmarked face," said an eighteenth-century milkmaid, with a proper pride in her youthful beauty. "I've had cowpox, and girls who have had cowpox cannot take smallpox." That remark, made to or overheard by Jenner, is possibly a suitable beginning for this paper, as it foreshadowed an early and outstanding piece of research in general practice. Jenner at that time was apprentice to a country doctor at Sudbury, in Gloucestershire, and found that this was a well-established belief in the county.

Osler, whose historical accuracy in this matter has never been questioned, has many interesting things to say about smallpox. "For centuries it had been a popular belief among farmer-folk that cowpox protected against smallpox. The notorious Duchess of Cleveland, replying to some joker who suggested she would lose her occupation if she was disfigured with smallpox, said she was not afraid of the disease, as she had had a disease which protected her against smallpox. Jesty, a Dorsetshire farmer, had had cowpox, and in 1774 vaccinated successfully his wife and two children."

Jenner subsequently mentioned the subject to John Hunter, who in reply gave the famous advice: "Do not think, but try; be patient, be accurate." In 1780 the idea was firmly fixed in Jenner's mind, but it was not until 1796 that he made his first experiment. He extracted matter from the pustules on the hand of a dairy-maid, successfully inoculated a small boy, and six weeks later matter from a smallpox pustule produced no smallpox.

Even to-day at rare intervals a country doctor sees these pustules on the hands of a milker. I last saw a man with this condition five years ago. He told me he had never been vaccinated. "Well," I said, "that was not very wise of your parents, but you are well protected now."

Benjamin Waterhouse, of Harvard, with whom Jenner exchanged affectionate letters and presents but never met, carried on the work in the U.S.A., and with a series of successful experiments was said to have fully justified the conclusion of the Board of Health—"cowpox is a complete security against the smallpox."

The impression one gains of Jenner is of a man who realized that well-founded traditions of the countryside are worthy of notice, and of his extreme patience. "The picture is that of a likeable, clubbable fellow, who could sing a good song and turn a copy of verses, *with* a taste for natural history" (M. Greenwood). He has been assailed with much criticism, and not least from Creighton, who could see no good in him, even to the extent of pouring scorn on his observations as a naturalist, his observations on the behaviour of the infant cuckoo in its foster-parents' nest being characterized as a "tissue of inconsistencies and absurdities."

Greenwood, from whose *Epidemics and Crowd Diseases* I have acquired these facts, says: "A moving picture has been taken of a young cuckoo ejecting its foster-brother from the nest and photographs of young cuckoos conforming to Jenner's description of their structure have been exhibited at a meeting of a learned Society"; so it would seem that in this instance Jenner was not the imaginative rascal of Creighton's showing. A man who unhurriedly followed up a country belief and patiently waited to confirm it is worthy of our regard, and many will believe that his labours were and still are the means of saving thousands of lives.

An Early Epidemiologist

When Jenner died in 1823 a boy of 12 was being brought up in the traditions of medical practice in the family home at North Tawton, Devon. He was to achieve fame in his lifetime, and, like Jenner, became a Fellow of the Royal Society; but his views were described as peculiar, and he was almost completely forgotten until a very few years ago his memory was revived, mainly by Edwin Goodall.

William Budd's *Typhoid Fever* is one of the treasures of the epidemiologist, and his cold reasoning is a pattern to all those who essay to study the natural history of disease. He shows particularly the advantages of country practice in the study of these problems. "How often have I seen in past days, in the single narrow chamber of the day labourer's cottage, the father in the coffin, the mother in the sick-bed in muttering delirium, and nothing to relieve the desolation of the children but the devotion of some poor neighbour who in too many cases paid the penalty of her kindness in becoming, herself, the victim of the same disorder."

William Budd was no armchair epidemiologist, as this passage shows; his contact with his patients was personal and vital and he himself had been a sufferer from this fever. He points out his own peculiar advantages: "In addition to the advantages enjoyed by country doctors generally, in the observation of such events, there were others peculiar to the position I then occupied. Having been born and brought up in the village, I was personally acquainted with every inhabitant of it; and being, as a medical practitioner, in almost exclusive possession of the field, nearly everyone who fell ill, not only in the village itself but over a large area around it, came immediately under my care. For tracing the part of personal intercourse in the propagation of disease, better outlook could not possibly be had." Thus step by step he shows us that typhoid fever, thought in his day to be due to vague insanitary influences, was unexplainable except by the conception of contagion from one patient, directly or indirectly, to another.

But this is not all of William Budd, and, although at the time of writing the following he was a consulting physician in Bristol, one feels that it was his earlier experience in general practice which really inspired it.

"The idea that phthisis is a self-propagated zymotic disease, and that all the leading phenomena of its distribution may be explained by supposing that it is disseminated through society by specific germs contained in the tuberculous matter cast off by persons already suffering from the disease, first came into my mind, unbidden so to speak, while I was walking on the Observatory Hill at Clifton, in the second week of August, 1856. The close analogy between this disease and typhoid fever had often impressed itself upon me with great force while I was engaged in the study of the latter. . . . I now saw with a clearness, which had never occurred to me before, that with exception of the qualifications necessary for its application to a chronic disease—for the most part of slow evolution and indefinite duration—the leading conclusion to which I had been led, respecting the propagation of the fever, might be applied with the same strictness to phthisis also."

A Great G.P.

I am choosing a trio of the greatest of our general practitioners to build up my story, and the next giant is a rugged Scot who was born in Scone in 1853.

After James Mackenzie had become a partner in a practice already of high traditions in Burnley, he set out to make himself a better doctor, the idea of research never entering his head.

"About 1883 or 1884," his biographer tells, "I resolved to begin a series of careful observations entirely for my own improvement, never dreaming of research, for I was under the prevalent belief that medical research could only be undertaken in a laboratory or, at least, in a hospital with all the appurtenances. . . . I had recognized that when the patient had some physical sign and when disease had made considerable ravages in the body, a moderately accurate diagnosis could be made, but in the vast majority of patients there was no physical sign, or, if there was a physical sign, I was not sure of its relationship to the patient's ill-health."

He goes on to show how he began by taking notes of all his patients and then decided to narrow it down to those whose signs, and above all symptoms, were connected with the heart; and that was where general practice came in: there was continuity, and "he was waiting to see what would happen to men, women, and children who showed these symptoms," and he was able to wait.

It ill becomes me to criticize this great man whose life was as truly a success as a life could be, but I feel that he did make one mistake—that is, in leaving Burnley, and breaking this continuity—and that he himself realized this when he quietly withdrew himself from London to semi-retirement at St. Andrews, where he regained something of the atmosphere of his general-practice days.

Every young doctor should read the life of this lovable man. It has been a source of inspiration to me, as it will be to hundreds of other general practitioners. It exasperated him to think that all the recognition that he received and all the honours that were heaped upon him were due to his *polygraph*—the very useful instrument he invented—and not to the principles underlying his work. In *The Beloved Physician* we learn most of what we want to know about research in general practice.

A G.P. with a Hobby

There is one among the many G.P.s who have added to the sum of human knowledge whom I cannot pass over, and his work was not strictly medical. Many doctors have done outstanding research in fields other than medicine, and I myself have known at least two distinguished antiquarians whose medical work was of a very high standard in addition.

The man I have in mind was a capable general-practitioner-surgeon whose ability in this work was recognized by the Royal College of Surgeons by the award of the rare honour of its Fellowship as a member of over 20 years' standing. Muir Evans, of Beccles, in Suffolk, who died at the age of 80 in 1947, used to say that he gave nine-tenths of his life to his profession and the remaining tenth to his hobbies. His field biology was a collateral of his work as a doctor, and his researches, beginning with the poison glands of fish, were of a very high order. In a paper on the pituitary gland of the eel, published in this *Journal* (April 6, 1940), he traced the seasonal changes in this gland.

One feels that a man engaged in busy practice who could produce so much in one-tenth of his working day must have done much for his patients.

A Word on Record-taking

Shortly those of us in general practice will receive a record envelope, similar to that we have become accustomed to for N.H.I. patients. I cannot stress too strongly the benefit we shall all gain if notes on these are kept conscientiously and, let me add, briefly. Thoughtful records are at the root of all good clinical work.

Let these notes also be legible. Old-fashioned people consider careless illegible handwriting a form of bad manners, and notes written in this way are valueless and a source of irritation often to those who write them. First of all a fine pen should be chosen and time taken over the procedure. The typewriter is a good get-out for the illegible writer, but I very much doubt whether it can be used in this instance; so I say to those whose education has not included calligraphy, buy a copybook and learn to write a neat legible hand.

Research Through the New Health Service

I am sad that so little has been said lately on group practice in the new Health Service. In the opinion of many there was fresh hope for the efficiency of general practice in the suggestion that doctors should work not as detached individuals but in groups—and if any contemplation of research is present, work in groups is of the highest importance.

It is not easy to indicate particular lines of research; indeed, it is undesirable to interfere with individualism. Every man, or rather every group, should choose his or its own. The following is the sort of incident which would suggest an investigation to me.

Many years ago, in one of our villages, I saw a sad little procession approaching me. An old friend and a great village character was being brought home dead in a cart, surrounded by his sorrowing relations. He had died suddenly out in the fields. He had consulted me many times because he was the victim of an intolerable pain in one of his calves after quite a short walk. This disappeared quickly on resting (as he was bound to do), only to return on another attempt.

I was very young. I had heard of intermittent claudication (how much happier is Ryle's name for it—angina cruris), but this was the first time I had met it. This incident set me thinking. "Is it a true danger sign; ought I to have warned poor James's relatives? Are all people who suffer from this complaint candidates for being brought home dead in carts or, in other words, liable to sudden death, probably, as he was in the fields, after exertion?"

Such were the thoughts that came tumbling into my head that morning as I stood on the village green. If I understood rightly the nature of the complaint it seemed more than likely that such people would die suddenly. This, then, was my first example, and my later experience is not great, but the end has been nearly always the same. The last sufferer was a dear old lady who, dozing quietly on a Sunday afternoon, suddenly became aware that her cherished garden had been invaded by a flock of geese from the village. Jumping up in a rage to drive them out, she dropped down dead. This is the only instance I have known of angina cruris in a woman.

It is an important subject, and the pooled information of a number of G.P.s would answer such questions as I asked myself that tragic morning. A group of sound general practitioners in a northern city lately, I am told, made systematic observations on the different psychological types in their patients suffering from peptic ulcer, with remarkably consistent findings.

Dental caries has always been to me a reproach as well as a fascinating problem, and I should much like to see whether painting the teeth twice—once before and once after the second dentition—with a solution of sodium fluoride really does protect against decay as our American friends tell us. Let me suggest this as a problem for a Health Centre, where I hope the examination of schoolchildren will at some future date be conducted by the family doctor, the doctor who will attend the child if he is sick, and not by the efficient but impersonal official.

But the problems are legion, and I feel inclined to reverse the idea of Mackenzie's and to suggest that an attempt to add to medical knowledge by the investigation of particular problems would inevitably produce a better general practitioner and, incidentally, would not fail in its objective.

The point of view of the country doctor is largely epidemiological, and that in its widest sense. If he were to find a proportion of his young girl patients victims of enlargement of the thyroid gland it would be fitting of him to inquire into the local conditions and to attempt to find out if there were anything in these which might contribute to the knowledge of its causation. He might then suggest a more generous fish diet—fish is not a common article in the country diet—even if it came from the village shop in tins. He might suggest the use of iodized salt as a routine, or he might even persuade his local M.O.H. to add iodine to the water supply.

There are problems of heredity which are readily available: the hereditary nature of skin diseases such as psoriasis, of rheumatic heart disease, as well as more obvious hereditary diseases such as Huntington's chorea or Friedreich's ataxia, and conditions such as polydactyly. There are also many problems in the study of epidemic disease waiting to be solved.

Writers of textbooks on infectious disease are handicapped, and are too often bound to give approximations, say, in the length of incubation period and the duration of infectivity for want of definite information. Yet this information lies within the grasp of the country practitioner if he be interested and will give his mind to it.

In country places that short and only possible exposure which alone gives this accurate information can very often be traced in a way which is well-nigh an impossibility in a town, with the varied experience of the town dweller. Country doctors should all read William Budd's *Typhoid Fever* and realize in those pages how great are their opportunities and how much better and more interesting would be their work if the lead which lies close to hand were assiduously followed. Work of this sort in the field is a possibility in itself, but its value would be greatly enhanced should the practitioner form a close liaison with the director of a laboratory. This helpful co-operation is now possible, or will be possible to all in the future.

Lastly, there must be a bond between the general practitioner and the medical officer of health and the Health Services. May I plead with the M.O.H. to get to know all the general practitioners in his area and to be willing at all times to give them his help?

Research is not a matter of gusts of inspiration but the result of patient observation undertaken with no thought of self-advancement. "In the fields of observation chance favours only the mind which is prepared." So wrote Pasteur. May those of us in general practice see that our minds are thus prepared.

A Clean Food Association has recently been formed in Caernarvonshire. It will have as its primary objects the safeguarding of the people's health and raising the hygienic standards of food production and handling. Representatives and officers of all the local sanitary authorities and of the county council, together with elected representatives of food production and handling organizations in the county, will be members of the Association. All restaurants, cafés, milk bars, etc., will be encouraged to attain and maintain a prescribed standard of cleanliness and hygiene in the preparation and handling of food, and to each establishment attaining the standard will be given an authorized certificate for display. Educational talks and film displays will be arranged for food handlers, and scientific information will be distributed to all those concerned. According to Dr. D. E. Parry-Pritchard, the County Medical Officer, Caernarvonshire is the first county in England and Wales to direct combined and co-operative efforts in this direction.

MEDICAL EDUCATION IN THE UNITED STATES

BY

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From the British standpoint the study of American medical education is valuable chiefly because it throws into relief the characteristic features of our own system. Although they have much in common, the British and American systems of medical education each have many distinctive features. These are expressions of the different historical circumstances of the two nations, and the possibilities of directly transferring the methods of one country to the other are accordingly limited. Mutual influence is more likely to be fruitful; ideas and principles travel better than particular applications of them, and, if adopted, it is best that they should take forms suited to the national genius. It will be helpful first of all to describe the American institutions concerned in medical education.

Colleges

The highest form of general education is given in colleges of liberal arts and sciences. These institutions have no British counterpart; they are neither schools nor universities but have features of both. Some colleges are independent, under a president; others form part of a university, when they are administered by a dean. There seems to be no essential difference betwen the independent and the university colleges. The primary purpose of a college is to give general education of an advanced type, but professional subjects such as engineering are sometimes taught; research work is not a normal function of a college even when it forms part of a university.

Students enter colleges as a rule at the age of 18 and follow a four-year course, receiving at its close the degree of Bachelor of Arts (A.B.) or Bachelor of Science (B.S.). The degree is obtained by accumulating a required number of credits. These are records of the satisfactory completion of a certain number of hours in a course, as shown by examinations conducted by the instructor who gives the course. Comprehensive examinations similar to those in British universities are unusual. The standard of the American college degree is probably about the same as that of a British pass degree. The difference between American college degrees and British university degrees with the same titles lies not so much in the standard as in the range of knowledge required; for American degrees this is usually wider and less directly vocational than that represented by a British B.A. or B.Sc.

Universities

The typical American university consists of a college of the kind described above and a variable number of professional schools. The term faculty is used in two senses: first, in the abstract British sense of a main division of university work, particularly postgraduate work, and, secondly, to denote the staff ("the faculty" is exactly equivalent to "the teaching staff" in British usage). The college and each school are administered by deans; their powers are wide, resembling those of an English vice-chancellor, and the relation between a dean and the professors of his school is similar to that between the vice-chancellor and the senate of a modern English university. The chief officer of a university is the president, and the governing body a board of trustees—men of standing in

business or the professions. Each school manages its own affairs but is responsible to a central administration.

Students reading for higher degrees are known as "graduate students." Such students work in any building (college or professional school) with the necessary facilities, but all are deemed to belong to the "graduate school" of the university irrespective of their field of work. Although it has no buildings, the graduate school has a dean. Not all graduate students are research students; most of them read for the degrees of Master of Arts (A.M.) or Master of Science (M.S.). Training in research methods is usually given to candidates who have matriculated for the degree of Doctor of Philosophy (Ph.D.).

The professional schools often require their students to be college graduates. Work in such a school for a number of years leads to a professional degree, that of bachelor, except in medicine and related fields such as dentistry, in which it is a doctorate; originally the initial medical degree was M.B., but this has virtually disappeared. Surgery and obstetrics are not recognized by special degrees.

The most important non-professional degree is the Ph.D. This is awarded by the graduate school for work in any field of knowledge (including medicine) and is normally held by those teachers in medical schools who are not medically qualified. The Ph.D. can be obtained by three years' work after graduation as a bachelor at a college, but often four years are spent on it. The course consists partly in research work (on which a thesis is required) and partly in study similar in nature to an honours course for British undergraduates. The final examination is of a high standard and includes a searching oral test. The D.Sc. degree is normally awarded only *honoris causa*.

Some universities are private, being financed (apart from fees) by income from endowments, by gifts from private persons, or by grants from foundations; others are State or municipal institutions. Both types—the private and non-private—are organized on the same lines, and it is doubtful whether they differ in quality.

College and university students may live where they please. Many institutions have halls of residence known as "dormitories." Fraternities, which are student clubs and in many cases wealthy corporations, also maintain club-houses where the members may reside. The fraternities are often national organizations, and a single fraternity may maintain a house at each of many colleges and universities. Some fraternities are professional, their houses being reserved for students preparing for a specified profession. The corresponding organizations for women are known as sororities.

Medical Schools

Until the chaotic state of medical education in the United States was revealed in a report prepared by Mr. Abraham Flexner about forty years ago, many medical schools were notoriously inefficient. As a result of this report, about half the medical schools disappeared and standards were set up under the auspices of the American Medical Association and the Association of American Medical Colleges. The result is that the United States now possesses some of the best-designed and best-equipped medical schools in the world.

The first great American school, that of the Johns Hopkins University, Baltimore, was opened in 1893. The Johns Hopkins medical school is famous for many things; only three can be mentioned here: (1) it was the first American embodiment of the research spirit of nineteenth-century German medicine; (2) it set an example by requiring a high standard of general education in candidates for admission; and (3) it introduced, in 1914, the system of a full-time teaching staff in the clinical branches of medicine, thus placing the whole of medicine on a university basis.

The full-time system is now an accepted principle of medical education in the United States and has recently become so familiar in this country that no description of it is necessary. It is, however, worth noting that, like the full-time clinicians, the full-time pathologists are primarily teachers and research workers rather than routinists. The routine pathology—necropsies and surgical histology—is done (under supervision) by young clinicians who also share in the teaching of students. This arrangement benefits all concerned: (1) the clinicians, who receive a valuable training in the correlation of signs and symptoms with structural changes; (2) the students, who are largely taught by men with up-to-date knowledge of the clinical branches of medicine; (3) the full-time pathologists, who have adequate time for research; and (4) the hospital staff, whose heavy demands can easily be met owing to the number of routinists available.

At the Johns Hopkins University the medical school and hospital occupy separate buildings, but modern opinion favours the union of school and hospital in a single building. For example, at Rochester, New York, where a medical school was opened in 1925, a single building houses the medical school, the university hospital, and the municipal hospital, which for all medical purposes form a single institution. The plan of a single building was adopted with the object of promoting the closest possible co-operation between all departments, clinical and non-clinical, in teaching and research. The plan has the further advantage that duplication of services is avoided—the whole institution is served by a single workshop, animal house, photographic department, and pathological laboratory.

American medical schools are inspected and graded by the American Medical Association, which indicates shortcomings privately to the schools concerned; the American Medical Association thus performs functions that in this country would be regarded as appropriate to an official body.

The Johns Hopkins medical school has in the course of time lost its unique distinction owing to the rise of other first-rate schools. How many schools may properly be so described is a matter of opinion, but there is general agreement among American medical teachers that about twelve schools now qualify.

The Medical Curriculum

Pre-medical education is obtained in colleges. For prospective medical students the college course includes chemistry, physics, botany, zoology, English, and either French or German. In his final college year the student takes the scholastic aptitude test of the Association of American Medical Colleges. This is a test of (1) comprehension and retention of a previously unseen mass of facts, (2) visual memory, (3) memory for content of an anatomical diagram, (4) general information, (5) logical reasoning, (6) scientific vocabulary, and (7) understanding of printed material. The student's performance in this test, details of his standing in college, and reports from his science teachers are considered by the medical school and promising candidates are interviewed. On account of this careful selection most of the students admitted complete the course.

The medical course lasts four years, the first two being preclinical, the last two clinical. The subjects of study are substantially the same as in this country, but the systematic courses of instruction in pharmacology, pathology, and bacteriology are completed before clinical work is begun. Towards the end of the preclinical period

instruction in clinical methods is given. The clinical period is spent first in the wards, later in the out-patient departments. On completing his course the student receives as a rule the degree of M.D., which qualifies him for an internship (house appointment). The right to practise independently is obtained by passing one of the State examinations or the final of the National Board (roughly equivalent to the Conjoint Board). Many States require candidates for their examinations to have completed one year of internship.

Methods of Teaching and Examining

The student's work is carefully planned and supervised. In most subjects there is one teacher to every three or four students. Each teacher forms an estimate of each student, taking into account character and personality as well as ability. These estimates may be expressed as marks—as many as half the possible marks in a professional subject may be reserved for teachers' estimates, only half being obtainable at the examination. For this reason examinations are less important than they are in this country.

One or more subjects are commonly studied intensively all day and every day until the ground has been covered; in this way anatomy may be finished in six months, histology in three. The study of clinical subjects is similarly concentrated, each major and minor subdivision receiving so many months or weeks according to its importance. Throughout his course the student may spend most of the day (8.30 a.m. to 10 p.m.) in the laboratories, lecture rooms, or wards and has less time for reading than the British student. One or two half-days a week throughout the course may be kept free for work of the student's own choice—research work or an optional course.

During the clinical period the student has access to patients at all hours of the day and night. The student is an indispensable member of a team—the normal work of the hospital could not be done without him.

The standard of knowledge attained varies with the subject. In anatomy it is not so high as in this country, probably owing to the relatively short time spent on it and the consequent necessity for high-speed dissection. In biochemistry, on the other hand, the standard is much higher; in physiology, pharmacology, pathology, and bacteriology it is about the same. In the clinical subjects the student has more responsibility for his patients and does more routine work than in this country; on the other hand his experience, especially of obstetrics and emergency work, is often narrower than the Englishman's. Venereology receives more attention and forensic medicine less. Medical history is taught in some schools, forming one of the optional courses.

Perhaps the most distinctive feature of American medical teaching is the clinical-pathological conference. This is a standard form of instruction that the student attends once a week throughout the clinical period. The details of procedure vary in different schools, but the general plan can be seen from the following example. The conference takes place in the post-mortem room and lasts exactly one hour (12 noon to 1 p.m.). It is attended by all the staff of the pathology department, the radiologists, many clinicians besides those directly concerned with the cases studied, and all students qualified to attend. Three or four cases are presented on unfixed material that has been kept in a refrigerator. The following topics are dealt with in the order named: (1) clinical history, (2) *x*-ray report and demonstration of films by a radiologist, (3) comments by clinicians of "honorary" status, (4) post-mortem findings by the pathologist who performed the necropsy, (5) comments by the professor of pathology, who then answers questions, (6) formal description of the organs by the professor of pathology, (7) questions and general discussion. Criticism of the diagnosis and treatment is frank and free, and there is no respect of persons by either colleagues or students.

Discussion

From the information given above it will be clear that the American system of medical education differs considerably from ours, and some of its main features will be briefly discussed.

The selection of medical students is a difficult problem and probably explains the introduction of the scholastic aptitude test. It should, however, be noted that this is only one of the various aids to prognosis, and that great importance is also attached to the interview.

The preclinical study of pharmacology, pathology, and bacteriology would not find favour with British teachers. An elementary knowledge of these subjects is necessary if the student is to profit by clinical instruction; the completion of the systematic courses in them before clinical work has begun is undesirable. This point may be illustrated with reference to pathology. The object of teaching pathology to medical students is to enable them to understand the changes in structure and function that occur in disease and so to interpret signs and symptoms accurately. The discussion of pathological phenomena that the student has not seen in patients is largely a waste of time; for this opinion there is ample evidence from the experience of dental students when they have been required to follow a pathology course designed for medical students. Under these conditions the dental students are often bewildered, and the pathological instruction conveys very little to them. The fact is, of course, that pathology and clinical medicine and surgery are not distinct subjects that can be profitably studied apart, but simply different approaches to a single problem—namely, the man who is ill. Ideally, pathological teaching should thus continue throughout the clinical period. In practice, however, this would mean overloading the final examination, and a sensible compromise is to hold the examination in pathology some time before the final in order to allow the student to concentrate on the clinical aspects of his work. If the intimate relation between pathology and clinical work be granted it follows that a pathology course for dental students should be specially designed, at least after the completion of the study of general pathology.

The high proportion of teachers to students in American schools makes it possible to give the students more individual attention than is practicable in this country and also puts at the student's disposal a wider range of interests and experience. The elaborate system of grading of the students by the teachers is probably a natural development made possible by the abundance of teachers.

The significance of examination results is not the same as in this country. The American student is judged on his knowledge, class work, and personality, the British student on his knowledge alone. A pass in a British examination means that the student has mastered the essentials of a subject; a pass in an American examination does not equally guarantee this, because a proportion of the marks may be awarded on grounds other than the demonstrated possession of knowledge.

The intensive system of teaching allows the student too little time for reading and rumination and denies him the relief of studying different subjects concurrently.

Clinical-pathological conferences are a valuable means of correlating clinical findings and pathological changes. They are valuable for students and even more so for clinicians and pathologists, who are thus regularly brought into

conference. The conferences are most instructive when they relate to patients recently dead, since many of those attending will have seen the patient during life and will therefore have the problems of diagnosis and treatment vividly in mind; a conference on patients dead long ago is less instructive, despite the more complete documentation, including histological reports on material removed at necropsy. Since the main object of a conference is the instruction of students, the cases should preferably illustrate the common diseases, and the conference should be conducted throughout with the student's limited experience in mind; difficult cases requiring specialized clinical or pathological knowledge would be best discussed at conferences for graduates only.

Summary

The institutions concerned in medical education in the United States are described and the education of the American medical student is described and compared with that of the British student.

Medical education in America is conducted on the same general lines as in this country, and the subjects of study and their scope are substantially the same.

The distinctive features of American teaching are: (1) the sharp separation of non-clinical from clinical studies, (2) the high proportion of teachers to students, (3) the important place of the student in the hospital team, (4) the relative unimportance of examinations, (5) the intensive system of study, and (6) clinical-pathological conferences.

One year of internship is a common prerequisite for independent practice.

I am indebted for discussions to many medical teachers, British and American, and to British students who worked in American schools during the war. I am grateful to Professor I. L. Kandel for expert advice on American education and to Professor S. L. Baker for reading the manuscript.

Nova et Vetera

JOHN WILLIAMS AND THE EARLY HISTORY OF YELLOW FEVER

BY

G. M. FINDLAY, C.B.E., M.D., F.R.C.P.

The early history of most diseases is lost in the mists of time. This is not as a rule a matter of great importance, but in the case of yellow fever it would still be of considerable interest to know whether in historical times the infection had first passed from Africa to America or from America to Africa, or whether the evidence favours the view that the disease was present long before the coming of man, when Gondwanaland still included what is now South America and Africa. If the yellow fever virus could colonize a new continent in the sixteenth or seventeenth century it might conceivably do so once again.

One of the arguments which has always been used by those who favour the American origin of yellow fever has been that whereas the first recorded outbreak of the disease in the New World was in 1648 in Guadeloupe, Havana, and Yucatan (Du Tertre, 1667–71; López de Cogulludo, 1688), and almost certainly in 1647 in Barbados and St. Christopher (Ligon, 1657; Scott, fl. 1634–96; Winthrop, 1853), the first record of an outbreak in the Old World is not till 1778, when the Hessian, John Peter Schotte (1782), described yellow fever under the name of "synochus atrabiliosa" in St. Louis de Senegal.

An authentic record of yellow fever in Africa which considerably antedates Schotte has now been found. This occurs in a pamphlet published by John Williams at Kingston, Jamaica. The pamphlet is entitled "An Essay on the bilious or yellow fever of Jamaica." [Petet autem novum quoque consilium, non ab rebus latentibus (istae. enim dubiae & incertae sunt) sed ab his, quae explorari possunt; id est, evidentibus Causis. A. Corn. Celsi Praef.] Kingston: Printed by William Daniell, Printer and Bookseller, at the New General Printing Office, the corner of Water Lane in King Street, near the Court House, 1750.

This little work seems to have had only a limited circulation. There is no copy in the British Museum, but one exists in the library of the University of Edinburgh and another in the Surgeon-General's Library in Washington.* The first edition was, however, reprinted in London in 1752 by T. Waller, opposite Fetter Lane in Fleet Street, and was sold for the sum of two shillings. Of this edition there are more examples, as for reasons which will be detailed it created some general interest. Its significance, however, has been overlooked by those interested in the history of yellow fever. The "Essay on the bilious or yellow fever" met with considerable criticism from Parker Bennet, a physician resident in Jamaica, who wrote "An enquiry into the late Essay on the bilious fever." This inquiry stirred John Williams to a poetic flight in heroic couplets, after the manner of Mr. Pope, in "An Epistle to the Honourable Charles Price, Esq.," whereupon Bennet replied in "A prose epistle to a poetic epistle writer." This in its turn was followed by "A letter to Doctor Bennet" from Williams with the motto "The mouth of them that speak lies shall be stopped."—Psalms lxiii. 11. This letter could not have been published until after Nov. 27, 1750, and was the last written communication between John Williams and Parker Bennet, for on Dec. 29 they came to blows which, in the words of the anonymous editor of the 1752 reprint, "terminated in the death of both." Before retailing this curious incident it is proposed to discuss the reference to yellow fever on the West Coast of Africa.

Yellow Fever in West Africa

Williams describes very accurately the symptoms of yellow fever as he knew it in Jamaica. He then goes on, "I do not apprehend this fever is what we call a local disorder; for I have seen it upon the coast of Africa, and am well informed that in the River Benin they have a bilious or yellow fever acuter than what it was here, at the time of the expedition to Carthagena; the persons seized with this fever dying there in less than twenty-four hours. This disorder is generally brought on by suddenly cooling the body and checking perspiration after hard exercise in the heat of the sun for when sailors go to cut wood for the ship's use they are obliged to row several leagues against a current and then jump into the water to carry the wood on shore."

John Williams, it appears, had been a surgeon on a Guineaman, that is to say, a slave ship plying from Guinea to the West Indies, for Bennet twits him with having gained most of his experience in treating African negroes on the coast of Guinea. Bennet, it may be noted, was an M.D. of Edinburgh, while Williams, who is always referred to by Bennet as "Mr. Williams," states that he had acquired his experience "like honest and careful Sydenham" and had "made himself acquainted with the diseases of the country . . . never sacrificing his patient to any favourite hypothesis." That the assertion by Williams that he had seen yellow fever in Africa was not regarded as remarkable is seen from a statement by Bennet in his "Enquiry into the late Essay on the bilious fever." "We assure him," Bennet says, "that some of us have been in Africa, on board Guineamen, and in other islands of the West Indies as well as he, consequently we are equally entitled to write upon and cure the yellow fever. Physic is a science not to be acquired by mere dint of natural parts."

There is no doubt that Williams actually described yellow fever. According to him, "The distinguishing symptoms or diagnostics of this disorder are, besides what is common to fevers, great anxiety, heat and pain at the scrobiculum cordis, some degree of inflammation of the liver which frequently causes a jaundice, bilious vomiting or ejections, or both; sometimes an acute, sometimes a dense pain about the region of the liver, all manifest signs of inflammation. Sometimes we find the right hypochonder tumified, frequently hard. Many cannot bear pressure on the right side or to lie on the left. From these symptoms to worse—strong and continued convulsions of the diaphragma, intercostal muscles and stomach, aeruginose

*A microfilm of the first edition is now in the library of the British Medical Association.

vomiting—then vomiting black adust blood, appearing like the grounds of coffee mixed with acrid unfinished bile, the juices of the stomach and pancreas both very sharp—bleeding from the emunctories or delirium or phrenzy: general gangrene and death. These are indeed dreadful symptoms." This is by no means a poor description of yellow fever.

In many ways Williams was in advance of his times, for he distinguished quite clearly between yellow fever and the common bilious remittent. He notes, for instance, that the remittents described by Hippocrates were of a different kind from the yellow fever. "His bilious or yellow fevers were not so acute as ours, they terminating commonly in seven or nine days, sometimes in fourteen." In addition Williams seems to have recognized that he was dealing with something different from the common fever of Virginia. "In Jamaica . . . a cooling regimen, solutive and diluting medicines succeed best and the disease soon arrives to its acme or state and consequently is soon determined. In Jamaica in this ardent fever I treat of, the strongest alexipharmics and sudorifics would bring on a delirium or phrenzy and destroy the patient. In Virginia we are to promote, at all events, the concoction of the febrile matter by the use of alexipharmics and sudorifics, although by these we translate that febrile matter to the brain and bring on a coma: we must keep up the pulse until the crisis which generally happens on the seventh, ninth and sometimes the eleventh day. In Jamaica all we can do is little enough to suppress the fever. In Virginia nothing is so serviceable in the remissions as the Peruvian bark, or even in the height of the fever without regard to the exacerbations or remissions. In Jamaica the bark in all forms hath frequently been tried in the remissions but without success. Indeed it generally does much harm."

Williams was thus considerably in advance of Schotte, who still believed that the synochus atrabiliosa of Senegal was merely a more malignant form of remittent fever. Well on into the nineteenth century it was customary to classify deaths as from bilious remittent fever and malignant bilious remittent fever, and even as late as 1874 the *British Medical Journal's* "Own Correspondent" on the Gold Coast had difficulty in distinguishing between yellow fever and malaria. "The yellow fever on merchant ships," he says, "has been contracted in the Bights especially at Bonny where they lie for several days while steam tenders collect oil from the neighbouring rivers. The disease is really more a severe form of malarial remittent than true yellow fever but not a whit the less deadly."

Williams also had a fair idea of the pathology of yellow fever. "In subjects who died of this disorder the liver was increased in bulk and greatly inflamed: on the concave parts large black spots appeared; which were mortified parts of that viscus. The gall bladder was frequently empty. The mesenteric veins in the intestines which all deliver their blood into one large trunk which constitutes the vena-porta were vastly turgid with blood and the whole intestinal tube appeared livid; the inner coat being covered with a gangrenous bloody slough, which when washed off, the mesenteric vessels appeared blackish and turgid with blood. . . . If an inflammation happens . . . in the liver an ardent fever with a jaundice must succeed." Many later writers entirely ignored the pathological condition of the liver and concentrated on the inflamed condition of the intestinal tube.

Williams's views on prognosis also appear quite modern: "If a jaundice comes on soon, it is bad; if with livid spots fatal. If the vomitings are incessant, grow darker and the hiccup comes on, it is generally fatal. If the face is greatly flushed, and the vessels on the tunica adnata turgid with blood with a concomitant phrenzy you might expect the patient's death in a very little time; especially if the skin is dry. The blood is dissolved to such a degree sometimes as to force its way thro' the skin itself; or burst out from some small twig of an artery on the surface: and this haemorrhage is so violent, it cannot easily be restrained. This was the case of Doctor Dwyer and of several others."

It was by his remarks on treatment apparently that Williams stirred the wrath of Dr. Parker Bennet, and by his assumption that newcomers who had learnt only the theory of medicine could not possibly know how best to treat yellow fever. "These gentlemen argue," Williams says, "that by some occult venom, contagion, miasma or Je ne sais quoi the texture of the blood is broke whence it is turned into a vapid and putrid mass, runs off through the glands: therefore the blood is in the same state as in pestilential fevers and give sudorifics and what are called alexipharmics, as in the pestis, insisting the most likely means to save the patients is to keep open the skin. . . . How pernicious must the theriacal draughts, given by some in the beginning of this fever, be. How destructive cardiacs, volatiles and all spirituous medicines. If they will have alexipharmics why do they not give fresh lime juice which is perhaps the greatest in the world? Lime juice so powerfully prevents the dissolution and fluxility of the juices that it is almost impossible to raise a salivation by mercury, if the patient suck limes plentifully at the same time. These medicines, commonly called alexipharmics, hurry on the inflammation to a gangrene. Lenient purges and solutives cleanse the intestinal glands and promote perspiration internally." The word "alexipharmic," or "alexipharmac," it may be noted, came into use in France in the sixteenth century as a term for a substance to ward off the plague. It first appeared in English in 1605. Sir Thomas Browne (1646) in his *Pseudodoxia epidemica* states: "The horn of a deer is alexipharmacal." Other alexipharmics were lemon rind, marigolds, scordium, rue, and of course Berkeley's tar water.

It is not possible to say exactly when Williams saw yellow fever in Africa. From his own statement he wrote most of "An Essay on the bilious or yellow fever" in 1745: he mentions the hurricane in Jamaica in 1744 and the expedition to Carthagena under Admiral Vernon ("old Grog") and Brigadier-General Wentworth which occurred in March, 1740–1. Williams considered that Bennet was a newcomer in 1750, although Bennet had been in Jamaica since 1746. It seems improbable that Williams would have scorned the views of newcomers in 1745 had he been in Jamaica only four or five years. Williams would therefore have been on board a Guineaman some time between 1730 and 1740, and his description of yellow fever in Africa must antedate that of Schotte by at least 40 years. Roderick Random, it may be remembered, served on a Guineaman after leaving the Navy, where he had acted as a surgeon's mate during the attack on Carthagena. Actually Tobias Smollett was in Jamaica from 1741 to 1744: he married Ann Lascelles in 1747, the original of Narcissa in *Roderick Random* and a Jamaican heiress.

Parker Bennet and John Williams

Of John Williams no biographical details are available apart from those given in his three works: the "Essay," the "Epistle to the Honourable Charles Price," and the "letter to Dr. Bennet." Of Parker Bennet it has been possible to find out a little more. The register of the Church of St. Anthony, Montserrat, contains under the date Oct. 25, 1725, the baptism of "Parker son of Mr. Edwd Bennet and Jane, his wife."

In the list of graduates of Edinburgh for the year 1745 is the name of "Parker Bennet ab. Ins.S.Christoph." This explains his statement that "some of us have been . . . in other islands of the West Indies." Bennet does not seem to have been in West Africa. There were, it may be noted, only two other doctors of medicine in that fateful year in Edinburgh, "Ebenezer McFait, Scoto-Brit," and "Robertus Willan, Anglus." Parker Bennet's Thesis, or, as it was then called, his "Dissertatio Medica Inauguralis," was entitled "De Menstruis" and was dated June 18, 1745: it was printed in Edinburgh by W. and T. Ruddiman. Bennet's name was spelt on the title page "Bennett." His name spelt, however, with one "t" is found in a manuscript record book of scholars, masters, and apprentices now in the library of the University of Edinburgh. This book was apparently begun by Alexander Monro, primus. It gives no address for Bennet, but records that he had paid the fee of three guineas and that his master was Alexander Cunningham. Bennet must have graduated before he was 21, but there were then no regulations and an M.A. was often taken at the age of 15 or 16. Robert Hamilton, of King's Lynn, appears to have taken his M.D. in 1791 at the age of 17.

It is not necessary here to follow the gradually mounting tension shown by each succeeding production from the pens of John Williams and Parker Bennet, a progress from the retort courteous to the lie direct. One instance must suffice; Williams in his epistle to Charles Price (afterwards Sir

Charles Price, Bt., Speaker of the Jamaica House of Assembly) refers to "Bennet, whose trifling writings no point hit, That fop in learning and that fool in wit." Two accounts of the final episode have been found: one in the *Gentleman's Magazine* for 1751, vol. 31, p. 136, and the other as an introduction to the literary remains of John Williams and Parker Bennet. Both descriptions are anonymous but are probably by the same hand. The second is entitled, "An authentic account of the death of the unfortunate doctor Williams and doctor Bennet of Kingston in Jamaica, on the 29th of December, 1750, caus'd by the following Papers." As it is short it may be given *in extenso*.

"After a great deal of ill language they proceeded to blows, which caused challenges and acceptance, and the morning after doctor Bennet went arm'd with his sword and a brace of pistols to doctor Williams's door very early, and knocked him up; Williams saw from his window who it was, and what he had to expect; upon which he loaded his pistols with Goose, or Swan shot; and slinging his drawn-sword by a ribband upon his wrist, came down, and opening the door, just sufficient to admit his hand with a pistol, poured a shot full into poor Bennet's breast, who had delivered his own arms to his boy, whilst he called Williams out; which when he had done, he continued to pursue Bennet, reeling to his boy, and wounded him with the other pistol in his knee. Bennet by this time had gained his sword only, which was fastened so strongly in the scabbard, that with all his endeavours he could not draw it. When Williams had fired his second pistol, Bennet turned upon him, thanked God he had power to be reveng'd, and whilst he endeavoured to release his imprison'd weapon, begged of God to invigorate him a few moments; but Williams then gave him a mortal thrust under his right arm, which pierced the lungs on both sides; having done this he was turning to run for it but that moment Bennet drew his sword, and made a pass at Williams, which entering under the right clavicle or collar bone, pierced the internal jugular vein, and finished its course in the shoulder blade, breaking off at the place of entrance; however, Williams run ten or fifteeen yards and then fell, suffocated with his blood, and never spoke more. The unfortunate Bennet survived him about four hours, and then expired, in the most agonizing pains imaginable."

So ended the careers of "the eminent physicians," John Williams and Parker Bennet. Williams has one title to fame in that in 1750 he first recognized that yellow fever was the same disease in the Old and New Worlds. It was not till 1928 that his findings were conclusively confirmed by Theiler and Sellards.

My thanks are due to Mr. L. W. Sharp, Librarian to the University Library, Edinburgh, and to Mr. S. H. Watkins for information and help in preparing this paper.

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Reviews

PIONEERS OF SOCIAL MEDICINE

Some British Pioneers of Social Medicine. By Major Greenwood, D.Sc., F.R.C.P., F.R.S. University of London Heath Clark Lectures, 1946, delivered at the London School of Hygiene and Tropical Medicine. (Pp. 118. 12s. 6d.) London: Geoffrey Cumberlege (Oxford University Press). 1948.

"For many parts of nature can neither be invented with sufficient subtility, nor demonstrated with sufficient perspicuity, nor accommodated unto use with sufficient dexterity, without the aid and intervening of the mathematics." Professor Major Greenwood confirms this statement of Francis Bacon (*Of the Proficience and Advancement of Learning*, Book II) in this delightful book which embodies the Heath Clark lectures delivered to the University of London in 1946, for vital statistics are the touchstone of public health and social medicine. "I shall write more about 'sums' and less about laws than he [Simon] did," says the author in his introduction. He has therefore selected for his purpose those pioneers who laid the foundation of scientific vital statistics, which in our own time he has done so much to develop.

Though his FitzPatrick Lectures were on the history of medical statistics from Graunt to Farr, he alludes only briefly to the seventeenth-century pioneers and passes to the eighteenth century, by the end of which elementary statistical methods were practised widely; and the pioneers of that century—Howard, Lettsom, Percival, and Ferriar—based most of their arguments on statistical reasoning. The next exemplar is Thomas Southwood Smith, "the most attractive of the pioneers as a human being." It matters little that Smith's epidemiological doctrine is now as obsolete as that of Galen. It was Smith, with his colleagues Neil Arnott and James Phillips Kay, who demonstrated the evils of disease, poverty, insanitation, and ignorance. Chadwick, Shaftesbury, and Morpeth fired the guns, but these medical pioneers supplied the ammunition. There follows a well-etched study of the autocratic Edwin Chadwick, a reformer in a hurry, intolerant of public opinion. Chadwick's statistics are open to criticism, less so the conclusions he drew from them in the cause of sanitary reform. But by the time of William Farr, to whom two chapters of the book are devoted, the foundations of national vital statistics were well and truly laid. Farr made the dry bones of figures live by his gifts of literary exposition and showed how they pointed the way to practical methods of prevention, though Professor Greenwood does not think that he was so great as a pure epidemiologist as he was as a general vital statistician.

In the study of John Simon he emphasizes that early scientific training benefited his official work, that he combined scientific research with the work of preventive medicine, chose admirable and competent investigators, and that the Privy Council epoch (1858–72) was his golden age. The last chapter of the book is on Florence Nightingale and Francis Galton. The former pressed for statistical education, the latter invented the calculus of correlations and other aids to statistical research. In Appendix II, "The Epidemiological Future," the author consoles us by observing that epidemics of acute infection, such as measles, have never "wiped out" nations or even cities. This is a book to buy, to read, and to keep.

ARTHUR S. MACNALTY.

TAR DERMATOSES

Dermatoses among Gas and Tar Workers. By William David Jenkins, J.P., B.A., M.R.C.S., L.R.C.P. (Pp. 54; 19 illustrations. 25s.) Bristol: John Wright and Sons. 1948.

This monograph, published two and a half years after the death of the author, fills an important gap in industrial dermatology. It is of value not only for the information that it imparts but because it reveals a research technique of a high order. The lucid description of the processes and the hazards of the coal-gas and tar industry, the careful classification of some 6,600 employees according to occupational environment, the clear and painstaking account of the various lesions in relation to industrial history, and the compilation of the statistical data are all evidence of a clear mind and an acute power of observation.

The work is divided roughly into three sections. The first is on the carbonization of coal and the distillation of tar, and the author exposes some of the mysteries associated with these complex chemical changes. In the second he gives a clinical survey of occupational dermatitis in the industry, and in the third describes the neoplasms resulting from contact with pitch, tar, and allied products. He also gives sound practical advice about treatment and prophylaxis. It may be surprising to learn that contact with tar and pitch is not particularly conducive to the development of incapacitating dermatitis, but our own experience confirms this contention.

As with most first publications of this kind, it is not difficult to criticize. For example, we should like to have heard more of the aetiology of tar erythema and the chemical photosensitizers responsible for this temporary though painful reaction. Pitch and tar melanosis might have been discussed more fully, and also "shagreen skin." Moreover, though the account of papillomata and epitheliomata is full and comprehensive, the author does not mention the active carcinogen (3:4 benzpyrene) present in tar and pitch. No doubt these deficiencies (together with the provision of an index) would have been remedied but for the untimely decease of Dr. Jenkins. The quarto-sized volume is attractively printed on art paper, and the photographs, though not in colour, are clear and instructive. It will be welcomed by all who are interested in industrial medicine and dermatology.

PHILIP ROSS.

PATHOLOGY IN THE TROPICS

Manuel de Pathologie Exotique. By C. Mathis and R. Pons. (Pp. 642. Cloth covers 1,400 francs, paper covers 1,000 francs.) Paris: Presses Universitaires de France. 1948.

In the last ten years we have probably seen more important advances in the control of tropical diseases than in any other decade in history. It is therefore with considerable interest that one opens a new textbook of tropical medicine, more especially one which purports to consider "the most recent advances in aetiology and therapeutics." Unfortunately one cannot fail to be disappointed, for, although it is published in 1948, internal evidence shows that the greater part of the book must have been written when France was cut off from the outer world.

To mention a few of the more obvious omissions—the new antimalarial drugs paludrine, chloroquine, and nivaquine are dismissed in three lines in a footnote; the quinine treatment of malaria receives two pages. The only drawback to mepacrine is said to be the yellow discoloration of the skin. The use of pentamidine, or in fact of any of the aromatic diamidines, receives no mention in the account of the treatment of kala-azar or in that of the treatment and prevention of sleeping sickness. The only drugs mentioned for the treatment of amoebic dysentery are emetine hydrochloride, bismuth salicylate, neoarsphenamine, and acetarsol. Sulphones are not referred to for the treatment of leprosy. Penicillin finds no place in the treatment of tropical ulcer and yaws, and in the latter disease bismuth salts, which are the cheapest drugs for mass treatment, are recommended only when the spirochaetes are resistant to arsenicals. In the treatment of rickettsial infections *para*-aminobenzoic acid is unknown: it would be too much to expect an account of chloromycetin. Sulphonamides are not mentioned for the treatment of lymphogranuloma venereum. Even when the authors advise using penicillin, as in the treatment of staphylococcal infections, they recommend that it should be given intravenously or subcutaneously. In addition to the omissions from the sections on therapeutics there are many other failures to take notice of recent advances, and many errors. The authors do not even hint at the existence of exoerythrocytic forms of malarial parasites, though they give much attention to the life history of plasmodia. They dismiss D.D.T. in two short paragraphs: fish are said to be preferable for destroying mosquito larvae. Neither Paris green nor gammexane seems to be known. No mention is made of recent work on blackwater fever; instead we are told that it is specially prevalent in wooded valleys. The account of yellow fever is totally inadequate. The authors emphasize the highly debatable point that yellow fever attacked the Spaniards on the discovery of Haiti but give no account of any epidemic of yellow fever among African natives since that in the late twenties. The enormous outbreak in the Sudan in 1940 is not mentioned, nor is the wide geographical extension of the disease to the east coast of Africa and as far south as Northern Rhodesia. The role of monkeys in maintaining infection is apparently unknown, and no mention is made of insect vectors other than *Aëdes aegypti*. Under the heading of tissue culture the only reference is to the attempt by Haagen and Theiler (1932) to grow the neurotropic strain of the virus. The use of the virus 17D for immunization is dismissed in a few lines and is recommended only for children in whom it is recognized that the neurotropic strain causes dangerous reactions. Similar errors and omissions mar the chapter on rickettsial infections: neither Q fever nor rickettsialpox is mentioned. To continue to cite further examples would only be tedious. A short but useful account is given of cosmopolitan diseases in the French colonies, but curiously enough infective hepatitis is unnoticed and no reference is made to the frequency of cirrhosis or of primary carcinoma of the liver. Poliomyelitis is said to have been introduced between 1920 and 1925. Beriberi is the only deficiency disease to which attention is drawn despite the malnutrition widespread in many French African colonies.

The book is well printed and produced and has an index, but its contents, in view of the claim to discuss "the most recent advances in aetiology and therapeutics," can serve only to point the moral of many of the discussions at the recent Royal Society Conference on the dissemination of scientific knowledge.

G. M. FINDLAY.

AMBULATORY SURGERY

Surgery of the Ambulatory Patient. By L. Kraeer Ferguson, A.B., M.D., F.A.C.S. With a section on fractures by Louis Kaplan, A.B., M.D., F.A.C.S. Second edition. (Pp. 932; 645 figures. £3 12s.) Philadelphia and London: J. B. Lippincott Company.

When the first edition of this book appeared in 1942 it was welcomed in this *Journal* because it seemed to fill the gap which existed between the usual handbooks of minor surgery and the full surgical textbooks. We noted then that the adjective ambulatory had been interpreted liberally and suggested that some of the conditions described were rather more severe than those it was customary to treat in the out-patient departments in Britain. But the increasing shortage of in-patient accommodation may force us to change our habits and to extend our ambulatory treatment to the wider limits indicated in this book.

The second edition maintains the virtues of the first but has been brought up to date without increasing its size; it includes accounts of such important new topics as the use of penicillin and the sulphonamides, tendon suture, and lesions of the back. There is much information in these pages that one may search for in vain elsewhere, and the teaching is sound. Some omissions have been needed to make room for the new matter; for the most part they are unimportant. However, there is one of interest we could not help regretting, although it has no practical application in this country—the intriguing story of the black widow spider. Having destroyed its smaller consort immediately after mating, it lurks under the seats of privies awaiting an opportunity to inflict painful and even dangerous bites upon the perineal regions of those seated thereon. Are such cases no longer met with in the U.S.A.? Have the privies now been rendered safe for democracy? The author of this very useful and commendable book does not enlighten us on this point.

NORMAN C. LAKE.

FOUNDATIONS OF HEALTH

The Foundations of Health in Childhood. By Norman B. Capon, M.D., F.R.C.P. The Convocation Lecture, 1947, of the National Children's Home. (Pp. 76. 2s. 6d.) London: National Children's Home and Orphanage, Highbury Park, N.

Childhood is essentially the period of growth, and Professor Capon regards the attainment of optimum health in each organ and system—"wholeness of structure and function"—as essential to the foundation of health in childhood. He outlines influences which, by operating during antenatal existence, birth, or infancy and childhood, may and do interfere with the realization of that aim.

Measures for establishing health in childhood must not be purely defensive or protective. The author discusses in simple terms a child's nutritional requirements; his needs for active

games and exercise under conditions favouring health and limiting the risks of accidents; and factors related to the elements of hygiene, to conditions of environment, and to lessened risks of exposure to infection. If these received more attention the health of the nation's children would be on a surer foundation. He recognizes that there is no one solution to the many outstanding problems. Education for health in childhood must continue unabated. The conditions under which children live, learn, eat, sleep, and play must be improved regardless of the sociological and economic problems involved. A proper appreciation of the true values of life must be encouraged. It is significant that in the concluding chapter, on the attainment of optimum health, Professor Capon describes needs which, while they are not essential to the continuance of life, are of the deepest significance in promoting and maintaining optimum health in childhood. These needs are for home life, happiness, opportunities for physical, mental, and emotional development, and the stimulus of good example.

This is an admirable book and should have a wide appeal. The author presents the needs of child health in simple and unbiased fashion. He depicts the child as one who should be enabled to attain optimum health in his own home. From first page to last the reader will appreciate how workers in the field of child health must pool their efforts if this ideal is to be attained. The tenor of Professor Capon's lecture cannot but encourage just that co-operation. Those who promoted the lectureship are to be congratulated on making this valuable address available in published form. Readable and modest in price, the book should be on the shelves of all family doctors, infant welfare and school medical officers, and social workers concerned with children. W. S. CRAIG.

VOLUNTARY SOCIAL SERVICES

Voluntary Social Services Since 1918. By Henry A. Mess *et al.* Edited by Gertrude Williams. International Library of Sociology and Social Reconstruction. (Pp. 255. 21s.) London: Kegan Paul, Trench, Trubner and Co. 1947.

The title of this book is slightly misleading, for there is a great deal of information in it about the voluntary services in the earlier part of the century. This is a fault in the right direction, for it gives a deeper perspective. The reviewer came to the conclusion that the book is even more valuable for the inferences drawn from examining the various agencies than for the great volume of information given about them. Their number and variety are amazing. The late Henry Mess, who wrote much of the book and inspired his colleagues, finds no legal definition of a social service but suggests that it is "a benefit which is being conferred on those who are relatively less well off or relatively unprivileged in some way." The authors demonstrate that the work of voluntary agencies is shifting from the remedial, which is now mainly in the hands of the State, to the constructive. None of the ten contributors has any doubt that there will always be a place for voluntary workers. They pay generous tribute to their pioneer efforts, and the fact that many of them have, so to speak, dug their own graves is no reflection on their capacity, for "all voluntary organizations and all social services should aim at destroying the need for their existence." The main characteristic of such organizations is their flexibility, which gives them the advantage when dealing with individuals. This flexibility is shown, too, when they come to co-operate with the State agency which has taken over their work, for it has tended to humanize the official body and make it more inclined to experiment.

The chapter by Henry Mess on "Social Service with the Unemployed" is exhilarating to read; it obviously came from the heart as well as from the pen of a man who had a unique experience of the experiments made during the black years of mass unemployment. He came to the conclusion that "the State can only embody the desires of contemporary Society. The Voluntary Association is not thus cabined and confined. Its proper task is always to give expression to the questing spirit of mankind."

The book can be cordially recommended not only as a mine of information but as a tonic for anyone who feels doubtful about the capacity of our people to rise to any emergency which requires kindliness, initiative, and public spirit. It is not only war that can bring out these virtues. Mr. Mess's chapter was an eye-opener to one of his readers. ALFRED COX.

BOOKS RECEIVED

[Review is not precluded by notice here of books recently received]

Feeding the Human Family. By F. Le Gros Clark, M.A. (Pp. 125. 7s. 6d.) London: Sigma. 1948.

An account for the layman of food production and distribution

Headache and Other Head Pain. By H. G. Wolff, M.D. (Pp. 642. 63s.) London: Geoffrey Cumberlege. 1948.

An analysis of the pathology and symptomatology of headache.

Pharmacology and Therapeutics in Nursing. By M. S. Dooley, M.D., A.B., and J. Rappaport, R.N., B.S. (Pp. 444. 22s. 6d.) London: McGraw-Hill. 1948.

A textbook for nurses.

Nursing in Diseases of the Eye, Ear, Nose and Throat. Edited by D. H. Webster, M.D., *et al.* 8th ed. (Pp. 309. 15s.) London: Saunders. 1948.

A textbook for nurses, with much new material in this edition.

Studies in Analytical Psychology. By G. Adler, Ph.D. (Pp. 213. 21s.) London: Routledge. 1948.

Studies based on the author's fifteen years' practice of analytical psychology.

Changing Disciplines. By J. A. Ryle, M.D. (Pp. 122. 12s. 6d.) London: Geoffrey Cumberlege. 1948.

Lectures on the history, methods, and motives of social pathology.

Nursing in Tuberculosis. By L. N. Cady, R.N. (Pp. 481. 20s.) London: Saunders. 1948.

For the qualified or student nurse.

Promotion from Primary to Secondary Education. By D. M. McIntosh, M.A., B.Sc., B.Ed., Ph.D., F.R.S.Ed. (Pp. 151. 1s.) London: University of London Press. 1948.

A summarized account of an investigation by Professor W. W. McClelland, of St. Andrews University, published under the title "Selection for Secondary Education."

Clinical Laboratory Methods and Diagnosis. By R. B. H. Gradwohl, M.D., D.Sc., F.R.S.T.M. and H. 4th ed. Vols. I, II, and III. (Pp. 1,295, 2,284, and 864. $40.00 for 3 vols.) St. Louis: Mosby. 1948.

A textbook of laboratory procedures used in diagnosis; this edition contains much new material.

The Radiology of Bones and Joints. By J. F. Brailsford, M.D., Ph.D., F.R.C.P., F.I.C.S. 4th ed. (Pp. 760. 63s.) London: Churchill. 1948.

This edition contains revisions and additions

Cardiography. By W. Evans, M.D., D.Sc., F.R.C.P. (Pp. 132. 25s.) London: Butterworth. 1948.

The author discusses electrocardiography and phonocardiography, and includes many cardiograms.

Rural Health and Medical Care. By F. D. Mott, M.D., and M. I. Roemer, M.D., M.P.H. (Pp. 608. 39s.) London: McGraw-Hill. 1948.

A study of the medical services in rural areas in the U.S.A.

A Handbook of Ophthalmology. By H. Neame, F.R.C.S., and F. A. Williamson-Noble, F.R.C.S. 6th ed. (Pp. 336. 21s.) London: Churchill. 1948.

Intended for students and general practitioners

Emergency Surgery. Part II. By Hamilton Bailey, F.R.C.S., F.A.C.S., F.I.C.S., F.R.S.Ed. 6th ed. (Pp. 388. 21s.) Bristol: Wright. 1948.

This part is on surgery of the abdomen.

Procedure in Examination of the Lungs. By A. F. Kraetzer, M.D. 3rd ed. (Pp. 150. 18s.) London: Geoffrey Cumberlege. 1947.

An introduction to the technique of examining the lungs for the student.

BRITISH MEDICAL JOURNAL

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SCIENTIFIC MEDICINE IN BRITAIN TO-DAY

Sir Henry Dale is the acknowledged leader of scientific thought in medicine in these islands. His activities in research have ranged over an enormous field in nearly half a century of service. In the experimental approach to physiology, pathology, and pharmacology his genius is representative of the best British tradition. His lecture on accident and opportunism in medical research, which appears in our opening pages, is a notable introduction to the series of articles on research specially contributed to the present Educational Number.

Professor L. J. Witts writes on the problems of clinical research in the light of a rich personal experience. He emphasizes the need for the trainee investigator to spend at least a year in a non-clinical department: it might be in biochemistry under Sir Charles Harington, or possibly learning about statistics to make up for what Professor Major Greenwood might regard as a defect in his undergraduate education. In his wide-ranging discussion the place of physiology and the physiological outlook scarcely receive the emphasis they deserve. The change in medical thought in our generation from its concern with structure to concentration on function has thrown a flood of light on present problems and given us high hopes for the future. At the end of the last century the scientific basis of clinical medicine lay in morbid anatomy and pathology, and German medicine was predominant. British medical science did not take kindly to this emphasis on structural change or to the meticulous cataloguing needed for the pathological documentation of disease. Our genius lay rather in the study of the dynamics of living processes, then being pursued mainly in the laboratories of animal physiology. It will be recalled that Sir Henry Dale's senior and junior contemporaries at the beginning of this century included such men as Gaskell, Langley, Sherrington, Schäfer, Fraser, Bayliss, Starling, Barcroft, Adrian, Hill, Haldane, Macleod, and Cushny. Fifty years ago clinical medicine was for the most part a subject separate from or unconnected with physiology. It was concerned with the natural history of disease so far as it could be recognized and classified by the patient's history and by the evidence of almost unaided eyes, ears, and hands. Then a great step forward was made when J. S. Haldane carried out his beautifully designed experiments on the control and regulation of respiration, using himself and his colleagues as experimental subjects. James Mackenzie, in his general practice in Burnley, at about the same time was carrying out his phenomenal single-handed feat of analysing cardiac irregularities with especial reference, as Dr. W. N. Pickles emphasizes, to prognosis. Mackenzie's only technical help came from a co-operative local watchmaker. He and Haldane established the possibility of accurate scientific observation on man in medicine and in physiology. It was with Mackenzie's powerful help that Thomas Lewis embarked on scientific medicine as a career. The application of scientific method at the bedside was pursued by Lewis almost in splendid isolation over a period of nearly 20 years, but gradually, between the two great wars, an increasing number of investigators found their inspiration in Lewis's example. He not only inculcated a strict scientific discipline in those who were personally associated with him, but he managed to secure the allocation of funds for direct scientific investigation of the problems of disease. This he effected through the Royal Society and the Medical Research Council, whose work is so clearly outlined elsewhere in this issue by Dr. F. H. K. Green. Concurrently with these developments the University of London and medical schools in other parts of the country established whole-time professorial units to enable their staffs to pursue studies in medicine with the advancement of knowledge as a primary duty. These units, now widely distributed, are in spite of many difficulties live catalysts of inquiry in our medical schools. Of these developments and of the achievements of our research workers we can feel justly proud.

In the United States there has been a tremendous growth of scientific medicine along somewhat similar lines, but with the difference that far greater numbers are engaged in work of this character. What Dr. Raymond Whitehead in his account of medical education in the United States refers to as an "abundance of teachers" is matched by a corresponding abundance of research workers. But the increased volume of work done in America is due not so much to larger numbers of whole-time university workers as to the spread of the spirit of scientific inquiry among consultants generally. The pace at which research is pursued in the United States is at times staggering, but quantity does sometimes overwhelm quality. A happy mean must be found between the rather casual attitude of some of our specialists to laboratory research and the highly competitive transatlantic drive to produce a paper a year.

Professor Witts is rightly concerned about the ethical problems of investigation in man, and draws a distinction between experiments on healthy volunteers and those therapeutic trials on patients which are often among the highest services that medicine as a science can render. Lewis himself and all who follow him insist that the sick man's interests must be paramount, and where research is pursued it must be accompanied by considerate kindness, forbearance, and sympathy with the patient. There are many who are by nature disinclined for detailed laboratory analysis of the physiological problems presented by disease but who are attracted by equally important studies of the influence of environmental conditions on the patient's health. This approach has grown to-day into social medicine, but social medicine and clinical science are collateral studies and in no sense mutually exclusive.

The way in which fundamental biological and biochemical research impinges on medicine is outlined in the article by Sir Charles Harington. In spite of Professor Witts's inclination towards animal experiment as an adjunct to clinical research, it is still the primary duty of the scientific clinician to study disease in man. There is no laboratory method of inducing diabetes, or for that matter

cirrhosis of the liver, which is *exactly* comparable to the clinical condition. At best we get only crude approximations. There should be a constant transference of questions from clinical medicine to the animal laboratory, whence ideas will return to the clinic, but the clinical investigator clearly cannot be as expert in the pursuit of pure biochemistry or experimental pathology as those who have specialized in such work.

The methods now available for the study of physiological reactions in living man in health and disease were undreamed of fifty years ago. We can now locate areas of functional activity in the brain; we can use radioactive iodine to evaluate the activity of the thyroid gland; we can measure the output of the heart, and all the activities of the lungs; we can outline the individual chambers of the heart by the injection of radio-opaque substances, and the newest electrocardiography permits an accurate location of areas of heart disease. Important parts of the alimentary tract and urinary tract can be viewed directly; blood flow in the liver, kidney, and brain can be estimated, and the functions of renal glomeruli and tubules can be analysed. Beyond this is the great realm of direct applicability of biochemistry, with the possibility of estimating an ever-increasing number of metabolic and endocrine functions. Medicine is now, in fact, a science in its own right, making use of almost all the techniques of the basic sciences. The methods are there, the problems are legion, and for the intelligent investigator the harvest of results will be rich. The future is in our hands, and there is no reason why the high tradition of research in British medicine should not be fully maintained under the altered conditions which since July 5 have changed the pattern of medical practice. The financial prospects for the keen young worker in clinical medicine were probably never more promising. It is widely agreed that the training of the clinical specialist should include a minimum period of a year in the acquisition of research discipline. This is a wise recognition of the need to establish habits of deep thought and scholarly reflection, a critical outlook on the flood of papers which pours from the medical press, and humility in the face of the unknown. But if the fundamental sciences on which medicine is based are to be well served by acute minds the universities must revise their conception of what a living wage for an educated man should be. University departments of physiology, pathology, pharmacology, anatomy, and biochemistry must be able to attract the medical graduate who has taken an honours degree in science, for it is in these departments that the fundamental discoveries will for the most part be made. The medical profession must press upon the universities the implications of the Spens recommendations for consultants and specialists.

By its very nature medicine must always make use of inductive reasoning—facts being collected and arranged until some general pattern is seen from which a tentative generalization may be made. Many of our generalizations are built in this somewhat insecure way, and as new facts make their appearance we tend to be unwilling to cast aside the old hypotheses that have served us well. It is only by careful and detailed consideration of stubborn facts that we can create new ideas. The ideas themselves must be subjected to constant testing by new techniques, constant revision, constant design of new experiments. This is the way in which the stream of knowledge is kept alive.

INTERNATIONAL CAUSES OF DEATH

Research does not start of itself, and discoveries are rarely made accidentally. Some stimulus is required, and the need for research on a particular problem is often demonstrated in the first instance by the tabulation of classified statistics. In the field of preventive medicine this is almost a truism, but in therapeutics the part played by the patient collection of figures often goes unrecognized. This applies also to the work which has been done in the past on the compilation of nomenclatures and classifications of diseases.

The International List of Causes of Death, which has now undergone six decennial revisions, is still almost unknown outside public health offices. The new International List[1] now includes non-fatal diseases, minor ailments, and different kinds of injury, and the decisions of the first World Health Assembly about its use marks the beginning of a new era of morbidity statistics. The distinction between a nomenclature and a classification is not always understood. A nomenclature is concerned with what are believed to be the different entities of disease in the light of medical knowledge at the time of its compilation and with the most suitable names for them. Alternative, less suitable, and out-of-date names for diseases find no place in it, nor do vague and ambiguous terms no matter how common their usage may be. A nomenclature represents an ideal which the medical profession is asked to aim at; but its absorption by the profession as a whole is a long process, and by the time it has been absorbed and adopted by the majority the nomenclature is already ripe for revision. Physicians and surgeons who are to-day writing medical certificates and records received their training at all periods throughout the past half-century, and the labels they have been accustomed to attach to varieties of illness will be only partially changed by the issue of a new nomenclature. A statistical classification of diseases, however, has to provide a place for every term and description of illness and injury which is being written on certificates and records now, whether it be good or bad, modern or effete. Furthermore, the grouping, while being as near to an ideal one as possible, has to be designed to give the greatest possible help to the present problems of preventive medicine and research. For these reasons a nomenclature will not serve the purpose of a statistical classification, and neither that of the Royal College of Physicians nor the Standard Classified Nomenclature of Logic was intended to do so.

At the time of the Paris Conference for the Fifth Revision of the International List in 1938 the need for a full classification of diseases and injuries for morbidity statistics was beginning to be felt, and the U.S. Government was asked to study the question in consultation with other nations interested. The outbreak of war made the preparation of such classifications imperative, and in this country as well as in the U.S.A. and Canada provisional classifications were prepared. The Medical Research Council's *Provisional Classification of Diseases and Injuries*, which started from a draft prepared by Stocks and Robb-Smith, was tried out for E.M.S. hospital records in 1943 and was published in 1944; the U.S. Public Health Service *Manual for Coding of Illness* was published about the same time. It was fortunate that each of these lists was built into the framework of the International List of Causes of Death, and that

[1] *International Statistical Classification of Diseases, Injuries, and Causes of Death.* WHO.IC/MS/I Rev. 1, 1947, Geneva.

they all had sufficient resemblance to suggest that an international classification might be constructed to serve the purposes of both mortality and morbidity. Since 1940 cause-of-death statistics had been founded upon the underlying condition which eventually led to death, and there was no logical reason why conditions which did not prove fatal could not be classified on the same basis and with the same code numbers as those which did. The General Register Office agreed, therefore, that an attempt ought to be made to compile such a classification. The U.S. Government then set up a Committee on Joint Causes of Death and at the end of 1945 invited representatives from Britain, Canada, and the League of Nations to discuss the problem of joint causes and the preparation of a classification applicable to morbidity. The latter task was given to a working party, including Stocks, Robb-Smith, and Biraud, which laboured for two months in Washington. Agreement was reached, and it was decided to submit the result for criticism by numerous medical organizations and specialists in the English-speaking countries with a view to offering it for the Sixth Revision of the International List due in 1948. In this country the Minister of Health appointed a committee with Sir Ernest Rock Carling as chairman to study the project and to prepare a tabular list of the principal conditions to be included in each category of the list. At Ottawa in March, 1947, the U.S. committee met again, reached agreement on the numerous amendments submitted, and presented the classification to an expert committee established for the purpose by the Interim Commission of the World Health Organization. That committee, with the Chief Medical Statistician of the General Register Office as its chairman, circulated the list to 70 Governments.

At a second session of the expert committee in Geneva the comments from some 40 nations were carefully considered and incorporated so far as possible. The finished product was again sent to Governments with an invitation to the International Conference for the Sixth Revision of the List of Causes of Death at Paris in April of this year. At that conference 29 nations were represented and the expert committee suggested that the Classification be adopted unanimously at the outset. Not only was that done but all the committee's recommendations for the use of the detailed and abbreviated lists were accepted in principle and other plans for international studies were made. The conference also accepted the proposal of the U.S. Committee on Joint Causes of Death that a form of death certificate enabling the certifier to decide which was the underlying cause (almost identical with that used by the General Register Office) should be recommended for international use, thus removing a serious source of discrepancy between the mortality statistics of different countries.

The First Assembly of the World Health Organization set the seal on all this work by accepting the recommendations of its expert committee and of the Paris Conference, and by deciding upon a set of international regulations for the use of the Classification for all purposes from 1950 onwards. In this country as well as in Canada and the U.S.A. its use for national morbidity statistics in 1949 is anticipated. The *International Manual*, which is being printed in Geneva in three languages, will contain a historical introduction, the detailed list of categories, each denoted by a three-figure code number, a tabular list of the principal included conditions with suggested (fourth figure) subdivisions of many of the categories, abbreviated lists for special purposes, the recommended form of death certificate and rules for coding when more than one cause is stated upon it, and the international regulations. A second volume, now in preparation, will contain an alphabetical index of over 20,000 terms likely to occur on medical records of all kinds.

THE DOYEN OF BRITISH OPHTHALMOLOGY

The September issue of the *British Journal of Ophthalmology* is a special number marking the eightieth birthday of Sir John Herbert Parsons. Fittingly the volume is a large one containing twenty-three articles by authors from many countries. Some of them are his friends and contemporaries, more of them are former students of his. In tribute to his many-sidedness there are three introductory appreciations, by Professor E. D. Adrian representing science and particularly physiology, by Professor J. van der Hoeve, of Holland, representing the International Council of Ophthalmology, and by Mr. R. R. James as the senior editor of the *British Journal of Ophthalmology*.

There are few people in British medicine who can look back upon eighty years of life crowded with so many diverse interests and so replete with accomplishment. Most of us are content with one main activity whether it be clinical work, fundamental research, or public life. To few is vouchsafed the ability to be at the same time a leader in all three. During his long working life Sir John Parsons from the clinical point of view was the foremost ophthalmological consultant in this country, and his reputation as a pathologist in his special field was exceeded by no one in any country of the world. He is still a recognized authority on the basic problems of natural science as they affect vision. During his most active period his advice and help were sought by the Government and by industry on all the varied problems in which vision is concerned. He served in the two world wars, in 1914–18 in an active capacity as ophthalmological consultant to the Army, more recently in an advisory capacity for the Air Force. Sir John Parsons was the dominant figure in British ophthalmology for many years, organizing, teaching, guiding research, and exerting a leading influence on questions of policy; and in international ophthalmology he was a constant and acceptable British ambassador. To all these activities was added an exceptional literary output, and among a wealth of scientific and clinical papers three books of his will remain classics. His four-volume *Pathology of the Eye*, published at the beginning of the century and still unsurpassed, came first; his book on colour vision was first published in 1915, and is still the most masterly and unbiased analysis of a subject till then chaotic. Most important of the three, his *Introduction to the Theory of Perception* appeared in 1927, and assembled the biological, psychological, and clinical materials of a complex problem, which has excited speculation since the time of Descartes, into a unitary philosophy, the importance of which is not yet fully appreciated.

It is good that Sir John's abilities, his constant efforts, and his great human qualities should have brought their reward in his lifetime. In his public work he was honoured by the State, and for his scientific work he was made a Fellow of the Royal Society. Every position of distinction and every prize that ophthalmology has to offer has been his, and his general medical interests were recognized when he was elected President of the Royal Society of Medicine. It is more important to remember, however, that he has moulded the thought and earned the gratitude and warm affection of more than one generation of ophthalmologists. On his eightieth birthday this feeling has found expression, through the Faculty of Ophthalmology and the Ophthalmological Society of the United Kingdom, in the presentation to him on Sept. 3 of his portrait in oils.

THE THRESHOLD OF PRACTICE

The proposal that an intern year—or, more exactly, a period of clinical experience under supervision—be added to the curriculum before the newly qualified doctor goes out into independent practice is supposed to have been first put forward in the B.M.A. Committee's report on Medical Education, published in 1934. From that time onwards the idea was certainly canvassed in many discussions, revealing a variety of opinion about the length of this consolidating period, the extent and nature of the supervision, whether registration should come before or after, and whether at the end of the year or whatever the period might be there should be an examination. Eventually the proposal came to rest in the Goodenough Report, one of the recommendations of which is that in future the entry upon independent practice shall be preceded by a compulsory period of approved and supervised clinical work. This was embodied in the draft Medical Bill submitted to the Minister of Health by the General Medical Council, and it was endorsed by the Curriculum Committee of the B.M.A., which reported this year, and which put forward suggestions on the best way in which the year could be used.

It was therefore a little interesting to come, quite by accident, upon an old article signed "C.A."—a reference to a list of contributors shows that the author was the late Sir Clifford Allbutt—buried in the *Encyclopaedia and Dictionary of Education*, published in four volumes in 1922. Sir Clifford Allbutt's article is only a brief one, but in it he puts forward the proposal for the adoption in British medical education of a compulsory year, after qualification, of general and special practice undertaken "under supervision." It may be of course that Sir Clifford Allbutt was by no means the first to make the proposal. Some investigator may trace it far back in the history of medical education. But if it was Sir Clifford Allbutt it is another example of the foresight of one of the wisest of our modern scholar-physicians.

Allbutt, however, did not seem to contemplate, as do later advocates of the idea, that this period should be spent in hospital. Apparently he saw the newly qualified practitioner taking his extra year under the supervision of a private practitioner, general or special. In the hospital ward, he says, the student cannot learn the many little necessary and useful arts and devices of the successful family physician and the elegant prescriber. He refers to complaints in the correspondence columns of the medical journals of that time that the new assistant, a university man it might be, could not make up a popular cough mixture or suggest pleasant solace for testy old people. Such accomplishments, along with more fundamental teaching and experience no doubt, might be acquired in the extra year. The young practitioner would learn the secret of the doctor–patient relationship—something which cannot be learnt, or learnt as well, on institutional patients.

Another point of interest in that little article of Allbutt's, written a generation ago, is that he appears as an advocate of the one-portal system (though it is necessary to qualify and explain his advocacy). What impressed him was the unfortunate competition, though perhaps unacknowledged as such, between the Conjoint Boards and the universities. In his view the examination for the Conjoint diploma came into competition with the examination for qualifying university degrees, with unfortunate results for both. It meant that in such competition there were an unduly large number of rejections in the Conjoint. That holds good to-day, when the rejections are not far short of 50%, whereas in many of the universities they are more like 25%. At the same time the university degrees by reverse competition are diminished, and there was a tendency, in Allbutt's opinion, to award them, not as marks of academic distinction but as little more than qualifications for practice, making them rank far below parallel degrees in other faculties. His remedy was the drastic one of proposing two orders of doctors. The one order would comprise the handy-men, well up in the ordinary standards of the day, dextrous in family practice, but making no profession of scientific learning. For these there might be one Conjoint examination. The others would be men who had gone through the longer course of the university, and whose education had been on larger scientific lines, and for such the universities would be able to expand their more liberal courses of study and bestow their degrees on candidates conversant with the larger conception and having a grasp of scientific methods. If Allbutt's idea of the supervised year looks like coming to pass, this other idea of his, entailing a bisected profession, probably never had much chance of acceptance, and nowadays has less chance than ever.

MEDICINE AS A WOMAN'S CAREER

Nearly eighty years ago five women, led by Sophia Jex-Blake, tried to prevail on the Senate of the University of Edinburgh either to open to them courses of study in the University or to accept certificates for courses arranged for women separately. The University finally decided against the admission of women to degree examinations. A School of Medicine for Women was then founded in London, opening in 1874 with fourteen students, and two years later an Act was passed to remove restrictions on qualification for registration under the Medical Act on the ground of sex. In 1877 Sophia Jex-Blake and others took the final examinations and were placed on the *Medical Register* as licentiates of the College of Physicians, Dublin, having done their clinical work in London or abroad. In 1878 the London degrees were thrown open. Paris was years ahead of any British university in this readiness to examine women in the Faculty of Medicine, and Elizabeth Garrett Anderson took the M.D. degree there in 1870. The Society of Apothecaries had admitted her to its final examination in 1865, and she had passed it, but the Society subsequently altered its charter so as to prevent other women from following in these intrepid footsteps.

In the new National Health Service there is complete equality of status and opportunity for men and women doctors. Medical women hold responsible posts in the Government service, under the Regional Hospital Boards, and in the employment of local authorities. A recent pronouncement was made to the effect that the position of Chief Medical Officer to the General Post Office will in future be open to men and women alike; previously this post has been available for men only. The field of work in the Colonial Medical Service is increasing for women as well as for men. The women's medical service in India is now closing down. Another field to which many medical women have devoted themselves is missionary service.

The Medical Women's Federation (73, Bourne Way, Hayes, Bromley) is the only professional organization in Great Britain and Northern Ireland consisting solely of registered medical women. It includes twenty-three local associations and has a membership of 2,300. The Association of Medical Women—the forerunner of the present Federation—was founded in 1879. The Federation came into being in 1916. It endeavours to bring before the main body of the profession the special minority difficulties of medical women, and, when necessary, to press for the full application of the principle of equality which has for so long been conceded by the profession as a whole. It works

in close and friendly relationship with the British Medical Association, and strongly encourages more women to take an active part in the work and activities of local Divisions. The Federation is often approached by Government Departments and other bodies seeking the opinion of medical women.

The Federation holds that with equality of opportunity goes equality of sacrifice, and it deplores the Government decision to exclude women doctors from conscription to the medical services of the Crown. Women doctors can volunteer for commissions as specialists, but the Federation feels that they should be called up in the same way as their men colleagues.

THE LISTER INSTITUTE

The report[1] for 1947–8 of the Governing Body of the Lister Institute of Preventive Medicine, the chairman of which is Sir Henry Dale, is a highly summarized account of work which is being carried on by a staff of about 40 in half a dozen departments. The Institute works in a number of divisions, concerned respectively with bacteriology, serology, and experimental pathology; with nutrition; with biochemistry and immunochemistry; with biophysics, and with the preparation and study of therapeutic sera, vaccine lymph, and bacterial vaccines. It also accommodates for the Medical Research Council the bacterial chemistry research unit, under the direction of Sir Paul Fildes, the national collection of type cultures, and the blood products research unit, and, for the Ministry of Health, the blood group reference laboratory. The blood products research unit during the year tested and prepared 20,000 bottles of dried human plasma for issue to hospitals, and produced 2,400 bottles of fibrinogen, 5,000 bottles of fibrin foam, and 500,000 units of thrombin for clinical use. The blood group reference laboratory examined 8,700 tubes and 3,500 bottles of serum for suitability for blood-grouping serum. Full Rh genotyping tests were carried out on 2,230 specimens of blood, and 1,070 specimens of serum were tested for anti-Rh and other abnormal antibodies. The national collection of type cultures has been reorganized, and a start has been made to bring the collection into line with the Medical Research Council's intention that only cultures of medical and veterinary interest should be maintained. The collection now consists of about 3,000 strains of bacteria, which are being checked for purity. About 200 new strains were added and over 8,000 cultures distributed during the year.

Much of the research work in the Institute is of a continuing character in which no conclusive results are to be expected in a particular year. Records of several of the investigations have appeared in the specialist journals, notably on the sequence of amino-acid residues, the production of stable potent preparations of penicillinase, the metabolism of nicotinamide and related compounds, the biochemistry of bacterial toxins, adsorption experiments with gramicidin and related substances, and electrophoresis in medical research. In connexion with this last investigation workers at the Institute have examined a group of sera from patients having different types of jaundice. It has been established that a small but definite fraction of the bilirubin migrates with the α-globulin in addition to the bulk of the bilirubin which migrates with the albumin. It has been further demonstrated that the binding of the bilirubin by different plasma proteins bears no relation to the nature of the direct van den Bergh reaction. The distribution of plasma proteins in malnutrition has been determined on a large group of sera obtained from cases of malnutrition in Germany. This forms part of an extensive general survey carried out under the auspices of the Department of Experimental Medicine at Cambridge.

One of the nutritional studies at the Institute has been an investigation of the effect of vitamin A—or, where it is unsuccessful, moderate doses of vitamin D—on the stomach. Human subjects with peptic ulceration diagnosed radiographically or who have pain without ulceration are being kept under observation. Patients have been obtained through the co-operation of the Post Office medical service—the completeness of the records and continuity of engagement makes the following up of employees relatively simple. Treatment with vitamin A has had no consistent effect on gastric acidity, but the results already obtained are said to confirm the claim of others that great benefit can be conferred in certain cases.

[1] *Report of the Governing Body of the Lister Institute of Preventive Medicine*, 1948. London.

CHILD HEALTH SERVICES

A survey of child health services in Berkshire, Buckinghamshire, and Oxfordshire has been prepared and published by the Regional Hospitals Council of the three counties.[1] The Council is part of the regional organization set up nearly ten years ago by the Nuffield Provincial Hospitals Trust, and the survey, which is a document of nearly 100 pages, appears under Trust auspices. Professor Alan Moncrieff, the chairman of the Child Services Committee (a committee fully representative of the medical and social services of the region), draws attention in the foreword to the need for a larger place in the medical curriculum for the medical care of children, since in the long run paediatrics can flourish only on a solid educational basis. Research also is needed not only into the fundamental causes of many disorders but also to discover the best means of educating handicapped children—children afflicted, for example, by muscular paralysis or defects of sight or of hearing. The common illnesses affecting the nose, throat, and ears of so many children also need co-ordinated investigation.

In the three counties an analysis made in 1945 showed that 59% of deaths in childhood (including stillbirths) occurred before the age of one month, 21% between one month and one year, and 20% between one year and fifteen years. Infections (particularly pneumonia) cause more than half the neonatal deaths after the third day, and since many of these are the result of obstetrical complications "it can be said that good maternal nutrition and good antenatal and obstetrical services are the principal factors in reducing stillbirth and neonatal rates." In the period from one to fifteen years the causes of death are more varied, but infections (tuberculosis now the principal) account for two-fifths of all deaths. The largest single cause of death in this age range is accidents, chiefly road accidents.

The report describes the present available and the ideal health services for children, and stresses the need for co-ordination between hospitals, medical officers of health, school medical officers, and general practitioners. One suggestion is for routine ward rounds or out-patient sessions by the paediatrician or his deputy, which general practitioners and medical officers could attend informally whenever they had the opportunity. The mental health of the children is considered in a special section of the report. In the area under review about 42,000 children may be expected to need some psychological or psychiatric observation; about half of these will require special tuition only, but some 12,000 will need mainly psychiatric as opposed to psychological help over varying periods of time, and to these must be added 7,000 children who need both psychiatric and psychological attention.

[1] Obtainable from the Secretary, Nuffield Provincial Hospitals Trust, 12, Mecklenburgh Square, London, W.C.1.

AROUND THE SCHOOLS

THE ANNUAL RECRUITMENT TO MEDICINE

The yearly additions to the *Medical Register* are once again increasing. Last year 2,787 names were added, an increase of 550 on the year before, and 500 above the average of the last twenty years, though rather below the average of the last five. In 1946 the number of new entries was the lowest for at least ten years—a reflection of the fall in student entries on the outbreak of war. Last year also the number of graduates from the British Empire overseas coming on to the Colonial List (410) was the highest on record. Only once before, in 1944, has this figure exceeded 300. The number from foreign countries (325) was nearly three times as high in 1947 as in 1946.

The total number of persons on the *Register* at the beginning of the present year was 77,929, being 14,500 higher than the average of the last twenty years. Twenty years ago the number of registered doctors was only about two-thirds of what it is now. The English registrations stand at 36,394; the Scottish at 20,634; the Irish at 10,233; and the Commonwealth at 6,409, this last including 813 "temporaries." The number in the Foreign List is 411, to which must be added 3,748 temporary foreign registrations—persons registered under the Defence Regulations, 1939, or the Polish Resettlement Act, 1947, sect. 5. As from February, 1946, no new registrations have been effected under the Defence Regulations, and sect. 5 of the Polish Act expired on Dec. 31.

The following table gives the position in respect of the *Medical Register* for the last ten years:

	Registered	Restored	Total	Removed owing to death or other reason	Number on *Register* on Dec. 31
1938	2,365	34	2,399	1,142	61,420
1939	2,968	49	3,017	1,027	63,360*
1940	2,384	37	2,421	1,102	64,679
1941	3,296	16	3,312	996	66,992
1942	3,556	7	3,563	1,127	69,428
1943	3,532	13	3,545	1,091	71,882
1944	2,971	11	2,982	1,218	73,646
1945	2,666	11	2,677	1,190	75,133
1946	2,237	14	2,251	1,092	76,292
1947	2,787	10	2,797	1,160	77,929

*Figure adjusted in 1940

The Student Entry

The number of medical students admitted to the schools during the academic year 1947–8 was 2,797. The table of student admissions for recent years is as follows:

1940–1	2,398	1944–5	2,612
1941–2	2,361	1945–6	2,610
1942–3	2,468	1946–7	2,553
1943–4	2,426	1947–8	2,797

Passes and Rejections

The passes in medicine given by the licensing bodies in the United Kingdom in 1947 numbered 2,594, and the rejections totalled 1,396. In surgery the numbers of passes and rejections were respectively 2,439 and 1,670, and in midwifery 2,631 and 1,460. The English Conjoint Board examined 811 candidates in medicine, 965 in surgery, and 1,060 in midwifery. Next to this the largest numbers were examined by the University of London—726, 628, and 608 in the three subjects. The proportion of passes was highest in Manchester (90.3%), with 72 entries, and lowest in the Scottish Conjoint, being only 49.5% in surgery, with rather fewer than 200 entries.

In the examinations in anatomy and physiology London had the greatest number of entries (820), and the percentage of passes in the two subjects was 79.15 and 72.04 respectively. The percentage of passes in the English Conjoint was 54.7 and 60.8 for 475 and 473 entries. The percentage of passes in physiology in the Scottish and Irish Conjoint was as low as 45. In Cambridge, for an equivalent entry, it was 60.8% and in London 72%.

The Forthcoming Academic Year

The applications of students for 1948–9 are reported by many of the schools to be well above the number which is regarded as the optimum. The most remarkable figures come from Edinburgh, where 1,400 applications for admission to the Medical School were received this year, and only just upon 200 could be accepted for the first-year course in October. The Welsh National School of Medicine, which has increased its intake up to the limit of its accommodation, has available places for 60 to 65, and 350 men and women have applied. It must be remembered, of course, that many intending students make application to several schools. St. Bartholomew's Medical College mentions the pressure created by many equally eligible candidates whereby the total will be considerably in excess of the 100 to which it is desired to limit it. At Charing Cross, with an annual admission of 45, priority is given, as elsewhere, to ex-Service students, so that many intending students coming from school are unable to gain entry and have to take their period of national service before beginning professional study. Other London schools report:

St. Thomas's: Eighty admissions into the clinical period; four places in first year reserved for colonial students.

St. George's: Taking the maximum.

Middlesex: Applications from both men and women greatly exceed the number that can be admitted.

At Oxford the number of students is restricted by decree; for the coming year it has been fixed at 65, and ex-Service students are admitted above this number only if born before 1929. At Cambridge the school will again be filled to capacity, but the intake is limited to about 210 by reason of laboratory space. At Birmingham the expected entry is 110, and at Sheffield the limit is 60, which makes selection from many hundreds of applicants difficult. All "firm" applicants at Sheffield are interviewed by a Selection Committee. Sheffield is one of the centres chosen for a long-term investigation into selection methods which is being carried out by Professor Aubrey Lewis and his collaborators under the auspices of the Nuffield Foundation. The investigation is a test of tests, not of individuals.

At Manchester and Liverpool the limitation is to 100 new students per session, but the applications are greatly in excess of this number. At Leeds the expected entry is 75 out of approximately 400 applicants. Bristol takes 60 medical and 25 dental students. The expected entry at St. Andrews is 80, and the same figure obtains at University College Hospital, London. In the University of Dublin the number of students admitted for the study of the basic sciences is limited to 150, and of these not more than 90 will be admitted to the first medical year (anatomy and physiology). It is added that in view of the very large number of applications received there is no reason to doubt that the accommodation will be very fully taxed. At Durham about 60 students are expected to enter the first year, and between 20 and 30 more will be admitted to the second year. At Glasgow the expected entry is 240.

Selection of Students

On the general subject of student selection, several of the deans mention selection committees. On this we have an interesting note from Professor J. W. Bigger, Dean of the Faculty of Physic, Trinity College, Dublin:

". . . The pre-medical examination is used as a means of excluding from the Medical School students who do not show promise of completing the course. As this school is situated in Ireland we consider it our primary duty to supply medical education to suitable Irish candidates, whether they reside in the northern or southern part of the island. When their needs have been satisfied the places remaining are allocated to those living elsewhere. Admission to the classes of the pre-medical year is controlled by an admission committee consisting of the Dean, one other representative of the Medical School, and two representatives of the non-medical staff of Trinity College. This committee has complete powers of admitting to, or excluding from, the school. In general the admission committee allocates places to Irish applicants who have become eligible for admission by passing the entrance examination of Trinity College or some other examination recognized as equivalent. The essential subjects include English, mathematics, Latin, and another language. Only when this school or examination record renders it improbable that an Irish candidate would complete the course successfully is he refused admission. When the non-Irish applicants are considered the matter becomes more difficult. There were 775 applicants from outside Ireland for admission to the session 1947–8, of whom only 31 could be admitted.

"The first basis of rejection is non-eligibility because the examinations passed have not included the subjects essential for admission to Trinity College, particularly Latin. The maintenance of compulsory Latin in Trinity College has been a boon to the admission committee.

Even when the non-Latinists are excluded there remain far more applicants than places. At the moment no applicant from the U.S.A. is accepted, because it is believed that if an American fails to get into an American school there must be some good reason for this failure and that it is improbable he would do well with us.

"A quota system has been introduced as regards certain other countries so as to prevent the admission of too high a proportion of students from any one country. There is, for example, keen competition for the limited number of places available for applicants from West Africa. Selection is mainly on the basis of examination record and personal recommendation of teachers and others in a position to judge the potentialities of the applicants. There remain the large number of applicants from Great Britain. They, in common with all applicants, must submit a form of application, giving personal particulars, education record, etc., and supply a photograph. The competition for places among this group is so keen that the primary basis of selection is examination record. Preference is given to men rather than women because of the already high proportion of women in the school, to those with good Service records, to children of doctors, and to those recommended by our own graduates or other persons on whose opinion we rely. Finally, some attention is given to the photograph. We believe that a candidate who looks alert, clean, and carefully dressed is more likely to succeed than one displaying other characteristics. We do not interview any applicants. We are not convinced that a necessarily short interview is of more value than the examination record and a personal recommendation."

Women Students

The Royal Free Hospital School of Medicine for Women, which was originally entirely a women's school, has had its first session as a co-educational one, and is slightly increasing its number of men students this year. The number of accepted students in 1948 is 87, being 74 for the first medical course, 11 for the second, and 2 for the clinical course, and 78 of the 87 are women. The students at present in the school number 461 women and 2 men. Here again the Interviewing Committee give special consideration to ex-Service men and women. The Royal Free Hospital group now consists of the hospital and its annexe, the former London Fever Hospital in Liverpool Road, the Elizabeth Garrett Anderson Hospital, the Hampstead General Hospital, the Hampstead Children's Hospital, and the North-Western Fever Hospital.

At University College Hospital, with a total entry of 70 or 80, the number of women admitted in the future will be 14 instead of 12. At Charing Cross 20% of the vacancies are allocated to women; at St. Mary's about 15%; at St. Thomas's the same.

At Oxford, of the 65 entries for the coming year 10 will be reserved for women. Manchester, Liverpool, and Bristol allocate to women one-fourth of the total places. At Sheffield all facilities in the Medical School are open to men and women alike, but the number of women entrants is subject to some limitation. In general, from 12 to 15 are admitted; the proportion during the war years was naturally somewhat larger. St. Andrews accepts women up to approximately one-third of the total. In the University of Dublin no restriction has up to the present been enforced in the case of Irish women students, but, in view of the high proportion of women students in the school, men applicants from outside Ireland are given preference over women applicants from outside Ireland. Women students have equal eligibility in all faculties of the University of Wales. At Aberdeen 25% of the entrants are women. At Westminster Hospital, London, women clinical students entered the school last April for the first time in many years. Competition for entry among women candidates is exceptionally keen, and it is hoped to increase the numbers admitted. About 40 women students are taken annually at Glasgow. In the University of Durham vacancies allotted to women are about one in four.

The Curriculum

Those responsible for the school curriculum deserve a certain amount of sympathy in view of the proposals for reform which have been showered upon them during recent years. They had hardly digested the report of the Goodenough Committee and the recommendations of the General Medical Council when they had presented to them the report of the Medical Curriculum Committee of the British Medical Association.* The Dean of one Irish school writes, perhaps with a touch of exasperation, that in view of the long consideration given to the two earlier reports it is improbable that his committee will devote much time to the third. Nevertheless, the third does present many new points of view. The Dean of St. Bartholomew's writes that those parts of the B.M.A. report which affect the College as distinct from the University have been noted with interest, but so many of the suggestions made—as, for example, in the matter of selecting students—have already been the practice of the College for a considerable time that no specific action is contemplated. The Royal Free Hospital Medical School states that the report has not as yet been considered by any committee, but is being studied with great interest by members of the staff. At Manchester the report has been passed by the Curriculum Committee to the Faculty. At Liverpool a special committee of the Faculty has it under consideration. At Birmingham consideration has been given to the report, and as a consequence the Faculty of Medicine has appointed a committee to review the whole of the curriculum. At Bristol it will be considered at the next meeting of the Medical Board.

Certain innovations in the curriculum are reported from various quarters. At University College Hospital, London, a period of senior medical clerking is planned to take place shortly before the Final. At the London Hospital Medical College a tutorial system providing small groups of students with a first assistant tutor throughout the whole of their clinical course is proving exceptionally valuable. An introductory course designed to help students in the transition from preclinical to clinical studies continues to prove highly successful, and liaison with the near-by hospitals for midwifery has added to the number of beds available for teaching in this subject. At St. Mary's Hospital the introductory course for the new clinical students has been widened to include the introduction of a number of special subjects.

At Liverpool innovations in the curriculum include the allocation of specific periods of time during clerking and dressing for instruction in the administration of anaesthetics and for clinical pathology. At Bristol an introductory clinical course has been arranged to bridge the gap between preclinical and clinical studies. At Birmingham some modifications are to be made in the early part of the clinical curriculum. On completion of the introductory course students will in future be directed to medical clerking or surgical dressing instead of, as at present, spending two of the three months of the long vacation attending a series of demonstrations designed to familiarize them with the broad outline of the activities of certain hospital departments.

In the Welsh National School of Medicine steps are being taken to revoke the requirement that candidates for degrees in medicine shall be graduates in arts or science and to adjust the curriculum accordingly. It is still desired that students should be encouraged to read for an honours degree in science before pursuing their clinical studies, but as this would involve at least another year's work it should not be obligatory. At Sheffield a further step has been taken in the transition from the old curriculum to the new. An introductory clinical course will be held in the April–June term for those who have passed the second M.B. in March; *ad hoc* arrangements have been made to meet the needs of students who fail in the second M.B., and also of the small but important group reading for the combined degrees of M.B., Ch.B., and B.Sc.(Hons.). All students before qualification have held resident appointments in medicine, surgery, midwifery, and paediatrics.

At Edinburgh from October next the course for the M.B., Ch.B., previously five years, will be extended to six. One difference is that the whole subject of anatomy will not be dealt with in the first-year course. The arrangement of the later years of the curriculum is still under consideration. At St. Andrews also a six-year curriculum, with implementation so far as possible of the recommendations of the Goodenough Committee, has been introduced. Short-term developments at St. Andrews include the appointment of whole-time clinical lecturers. At Aberdeen it is proposed to start in October a six-academic-year course, the first year to be spent on the pre-medical subjects of chemistry, physics, and biology. The rest of the course will follow closely that recommended by the General Medical Council and repeated in the report of the B.M.A. Committee. The only new development will be the establishment of a Chair of Biological Chemistry in the Faculties

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of Medicine and Science, and it is hoped that the first occupant of the chair will take up his duties at the beginning of the winter term. The curriculum at Glasgow is to be revised for 1949–50. In the University of Durham a change has been made in the second M.B., B.S. examination. Part I, held in March and after five terms' work, will consist of physiology only, and Part II, held in June, after six terms' work, will consist of anatomy, pharmacology, and pharmacy. The regulation will take effect from March next.

In the School of Physic of Trinity College, Dublin, the complete course extends to six years, made up of one year of pre-medical and five years of medical study. It is hoped in Dublin in the near future to establish a department of social medicine, but this cannot be done until accommodation for the department is available in the Moyne Institute of Preventive Medicine, which it is hoped will be ready for occupation in 1951.

A revised curriculum introduced last year at Westminster Hospital Medical School has proved its worth, and further changes are being considered. As a result of the new Act the school becomes autonomous, but its links with its parent hospital will be strengthened rather than weakened under the new system. Plans for expansion have been proposed, since existing resources for teaching pathology will soon be severely taxed. There are already enough beds for the clinical instruction of the present numbers. It is hoped eventually to create a 1,000-bed teaching centre in the area bounded by St. John's Gardens and Vincent Square, which are five minutes' walk apart. A pre-clinical school for 150 students is contemplated. Valuable experience of emergency cases is expected from closer integration with St. Stephen's Hospital, Fulham. Closer linkage with child-welfare centres in the district will ensure that students obtain instruction not only in children's diseases but in child health as a whole. The number of undergraduate students at Westminster is rapidly increasing and will reach 165 by next April.

The Older Universities

All students entering the Medical School at Oxford in future will be required to take the second public examination as before the war. The course normally adopted to satisfy this regulation is that of the Final Honour School of Animal Physiology, which takes up one year after passing the anatomy and physiology examination for the B.M. degree. The newly established clinical school allows students to qualify at Radcliffe as an alternative to transfer to a teaching hospital elsewhere. A students' club has been opened in Osler House, offering social facilities and sleeping accommodation for those on duty at the hospital. This social, administrative, and teaching centre will be completed by a lecture-room and a class-room which are soon to be constructed in an adjoining building.

It should be noted that at Oxford the various colleges put forward the names of students whom they wish to be admitted to the Medical School, and preliminary acceptance by a college is essential for any prospective medical student. Each of the colleges, whether for men or women, has a "society," and there is one non-collegiate society on each side. All inquiries should be addressed to the head of the society—principal, president, master, rector, as the case may be—and not to the secretary of the Medical School, and the prospective student is advised to make application well in advance of his or her eighteenth birthday.

At Cambridge it is proposed to establish a school of veterinary medicine, and during the preclinical period medical and veterinary students will work together in the basic subjects which are common to both professions. The post of Professor of Animal Pathology has been revived. If the proposal for a complete veterinary school for Cambridge is accepted, the new venture should be of mutual benefit to both medicine and veterinary medicine. The natural sciences tripos, in which the sciences ancillary to medicine are considered from a wider and more disinterested point of view and the student is allowed to interpret his study on larger lines—always the great and abiding advantage which Cambridge offers—will include instruction by the Professor of Animal Pathology. The first step has been taken towards a university department of paediatrics by the appointment of a paediatrician to the staff of Addenbrooke's. A department of human oecology has been set up, with the appointment of a reader. The University Health Service, under which prophylactic examinations, including mass radiography, will be carried out, will be ready to work to full capacity on the new intake in October.

Developments in London Undergraduate Schools

Long-term developments at certain London schools still concern rebuilding to make good war damage. Middlesex Hospital during the past year has completed its reconstruction; every bed is now in use, and students have the advantage of attending the wards and out-patient departments of the Central Middlesex Hospital, Willesden. Middlesex has made an arrangement with the North-Eastern Fever Hospital by which its students are resident for three weeks. An overall plan has been approved at St. Bartholomew's for the whole preclinical unit, and opportunity has been taken to incorporate resident quarters while replacing pre-existing departments. At University College Hospital the short-term development plan consists of the addition of some 300 beds by the taking over of St. Pancras Hospital. These include wards for the chronic sick, a modern obstetric block, and mental observation wards. The Hospital for Tropical Diseases is now part of University College Hospital, and will continue to provide clinical material for post-graduate teaching.

At Charing Cross the reopening of the anatomy and physiology departments last October has proved of great value. The students have successfully completed the first part of the course leading to the second M.B. examination, which will take place next March. The facilities of the hospital and school are reserved for the full-time undergraduates, and no courses for postgraduates are provided. As a result of the National Health Service Act the school is now separately incorporated from the hospital, but the close association between the two parts of the institution will be preserved by the interchange of members between the controlling authorities—namely, the School Council and the Board of Governors of the hospital. Planning for the new medical centre at Harrow continues to make good progress. A hospital will be erected there to accommodate 1,000 patients and a school with an annual entry of 100 medical and 50 dental students.

The London Hospital has increased its beds during the year to just upon 700. The redecoration of the Medical College, with complete renovation of the museum, and a new bacteriological department in the hospital have provided additional facilities for medical students. An annexe of 208 beds is still maintained at Brentwood, where students attend special courses and demonstrations, particularly in tuberculous disease of the chest.

At King's College Hospital Medical School, which provides the clinical instruction for students reading for the medical degrees of Oxford, Cambridge, and London, the present session has seen the establishment of two university chairs in the department of pathology—a chair of morbid anatomy and a chair of chemical pathology. A sub-department of bacteriology has also been established. The Borland Scholarship for Women, value £500, has been founded, and will be awarded for the first time in 1949. A Wiltshire Memorial Research Scholarship and a Legg Memorial Lecture have been established to commemorate two former members of the staff of the hospital and school. As from July 5 the school became incorporated under its own charter, and a new Academic Board will aid the Dean and the directors of clinical studies in effecting a gradual modification of the curriculum to bring it into line with the latest recommendations of the Goodenough and the B.M.A. reports. In view of the impossibility of enlarging the hospital for some years to come, arrangements have been made for the use of medical beds for teaching purposes in a near-by regional hospital. Plans have, however, been made to enlarge the Medical Research Council's dental research unit. It should be added that the preclinical studies are taken at King's College, Strand, and applicants are interviewed jointly by a committee representing the College and the Medical School. This committee includes a layman and a non-medical member of the teaching staff.

Schools Outside London

The main development at Bristol during the year has been the provision of studies and laboratories for the two whole-time clinical departments of medicine and surgery in the building of the Royal Hospital and adjacent to the respective wards. At Sheffield plans have been produced for the rebuilding both

of the Medical School and of the teaching hospitals, but it is still impossible to say when a start will be made. It is expected that Sheffield, with the sympathy of the city and other bodies concerned, will establish a whole-time chair of social and industrial medicine in the near future. Co-operation between city and university in another sphere has resulted in the establishment of a university department of forensic medicine, under the charge of Dr. Gilbert Forbes, police surgeon to the city, with the title of part-time senior lecturer. The establishment of full-time chairs of obstetrics and gynaecology and of psychiatry is in contemplation. Developments in the hospital sphere of interest in Sheffield, though not directly concerning the university, include the appointment of a clinical artist, the establishment of a department of medical photography, and the intended opening during the next year of a school of physiotherapy.

At Birmingham, where the difficulties caused by doubling the entry of students have proved formidable, considerable progress has nevertheless been made with the new developments in the Medical School. A second chair of anatomy has been created, and a further innovation has been made by the appointment of two professors of pathology—one in experimental pathology and the other in morbid anatomy. The first chair of anatomy and the chairs of physiology and medicine have been named after former distinguished members of the Medical School—Sands Cox, Bowman, and William Withering respectively. Following the practice of the older universities, whereby an outstanding individual is elected to a chair specially created for him, part-time professorships have been created in therapeutics and gastro-enterology, the latter the only one of its kind in the British Isles.

The regulations for higher degrees (M.D. and Ch.M.) at Birmingham have been amended, and the main emphasis will in future be on a thesis based either on original research or on the application of scientific methods to medicine or surgery. The regulations for the award of the M.D. degree in State medicine have been withdrawn and the degree abolished. The regulations for the degree of Ph.D. of the Faculty of Medicine have also been amended. Lectureships in operative surgery, vaccination, and applied anatomy have been abolished. The course in the last subject is to be under the direction of the department of anatomy in collaboration with the head of the clinical departments.

Under the National Health Act a "teaching hospital" has been formed in Birmingham and includes the names of those hospitals at which the teaching of dentistry and the four major subjects of the curriculum has up to now been carried out. This "teaching hospital" will be administered by a board of governors, on which there will be a strong university representation.

In the Welsh National School of Medicine the inclusion in the teaching group at Cardiff of the former municipal hospital at Llandough will help so far as the clinical period is concerned. As a long-term policy, plans are being prepared for a 1,000-bed teaching hospital, together with a new medical school.

POSTGRADUATE TRAINING FACILITIES

THE LONDON SCHOOL AND INSTITUTES

The British Postgraduate Medical Federation, to whose Director, Sir Francis Fraser, we are indebted for up-to-date information, is now a school of the University of London, and the Postgraduate Medical School at Hammersmith and the Institute of Psychiatry have been recognized by the University as federated institutes. A number of the other institutes in London await inspection by the Senate before they also receive similar status. All the institutes now provide clinical instruction of a high standard, though some of them, owing to lack of accommodation, are unable as yet to provide the facilities for research necessary for them to give education of advanced university level.

Last year advantage was taken of clinical facilities at certain municipal hospitals. This arrangement has now ceased, but the Central Office of the Federation hopes to make direct use not only of these hospitals but also of many others under the Regional Boards for the postgraduate education both of specialists and of general practitioners. For this purpose a Regional Adviser in postgraduate medical education is being appointed by the Federation, on behalf of the University, to each of the four metropolitan regions. Three of these posts have already been filled; no appointment has yet been made to the north-western region.

The duties of these regional advisers will be to carry out the policy of the University and the Federation in arranging postgraduate education; to act as liaison between practitioners in the region, the medical schools and teaching hospitals, the regional board, and the hospital management committees; to assist the undergraduate schools in finding for their graduates suitable house-officer appointments in non-teaching hospitals; to assist all medical schools in finding for postgraduates suitable appointments in non-teaching hospitals; and to arrange for general practitioners and public health officers of the region clinical assistantships in near-by hospital centres, regular clinical meetings, short courses, and longer or more intensive general refresher courses.

It is planned, by the way, to organize refresher courses on the same lines as in the past for general practitioners. Financial assistance was given to insurance practitioners on certain conditions in respect of their attendance at specially arranged courses. The Ministry of Health is now drawing up regulations which are expected to include grants for National Health Service practitioners. The Act provides that the Minister may enter into arrangements with universities and schools for the provision of courses which practitioners may attend, and may make payments towards the cost of providing such courses and the expenses of practitioners attending them.

The Federation and the three Royal Colleges in London have set up a joint board to effect co-operation in providing for postgraduates and to prevent overlapping. Sir John Anderson has agreed to be chairman, and the board will consist of two representatives of each of the Royal Colleges and of the governing body of the Federation. Among the matters to which the joint board will give its attention will be:

(1) Provision of advanced courses in the basic sciences.
(2) Opportunities for intending specialists to supplement responsible hospital appointments and practical clinical work by courses of lectures and demonstrations, etc.
(3) Access to clinical material for those attending lectures and demonstrations.
(4) Revision courses for established specialists.
(5) Postgraduate training in special subjects for graduates other than those intending to specialize in those subjects.
(6) Co-ordination of lecture provision.
(7) Procedure for enabling selected graduates from overseas to obtain suitable hospital appointments.
(8) Expert advice and guidance for graduates seeking education and training in the specialties.

The address of the Federation is 2, Gordon Square, W.C.1.

The Hammersmith School

For the following notes on the Postgraduate Medical School, Ducane Road, Shepherd's Bush, which is an institute of the Federation and has been a school of the University of London since its inception in 1935, we are indebted to Dr. Charles Newman, the Dean.

The teaching in the clinical departments consists of bedside teaching, reinforced with lectures, clinico-pathological conferences, radiological and post-mortem demonstrations, and attendance at operations. The full programme of organized teaching is carried on in ten-week periods, corresponding to the University of London terms. During the vacations the staff is engaged in research work and the higher education of selected students, but organized teaching ceases, and other arrangements are made for those students who are not selected to remain at the school. Short-term students desiring two or more terms of concentrated instruction are therefore advised to book in October or January so as to avoid including the long vacation in their stay. House appointments are usually made from among students, and facilities are provided for senior students who wish to carry out original research under the Director.

About 60 students can be accommodated in the department of medicine, and resident appointments are available for about 20. A similar number can also be accommodated in the department of surgery, which provides training for general surgeons, but instruction in orthopaedics, otolaryngology, and urology is included. Teaching is so organized as to be continued from

out-patient departments through the wards and operating theatres to follow-up clinics. Students do not themselves perform operations. There are at present no facilities for work in preparation for the primary F.R.C.S. examination.

The department of obstetrics and gynaecology is now joined with the combined school of Queen Charlotte's and Chelsea Hospitals to form a provisional Institute of Obstetrics and Gynaecology. It is therefore able to provide students with an increase in teaching facilities. The department at the Postgraduate School provides teaching in the antenatal and postnatal clinics and in the sterility clinic, as well as in the wards and operating theatres, and, in addition, lectures and conferences in term time. The department at Queen Charlotte's provides full scope for teaching in obstetrics, and the department at Chelsea provides more extensive teaching in gynaecology and gynaecological endocrinology than has hitherto been possible at this school.

The department of pathology is organized in four main sections: (1) morbid anatomy and histology, (2) bacteriology, (3) haematology and clinical pathology, and (4) biochemistry; and instruction is adapted to the requirements of the course for the diploma in clinical pathology of the University of London. The course lasts for one year, starting in October. There are twenty places available in this course, and selection from them is made in June. Fortnightly and six-monthly courses in practical anaesthetics are also given. In the department of radiology teaching is based on the requirements for the diploma in medical radiology.

The Specialist Institutes

The Institute of Cardiology (National Heart Hospital, Westmoreland Street, W.1).—Six appointments of registrar type are available per annum for physicians in training as cardiologists. Training includes clinical cardiology, radiology of the heart, electrocardiography, and research. General physicians may enrol for full- or part-time instruction for one term of approximately three months. There are three terms annually, starting in January, May, and October.

The Institute of Child Health (Hospital for Sick Children, Great Ormond Street, W.C.1, and Hammersmith Hospital).—Teaching in every aspect of child health is provided, including instruction on the newborn and premature infant. Three terms each of three months' duration, starting in January, May, and September.

The Institute of Dermatology (St. John's Hospital for Diseases of the Skin).—Clinical teaching in out-patient department twice daily, also facilities for study and tuition in the pathological laboratory.

The Institute of Diseases of the Chest (Brompton Hospital).—Teaching primarily by means of hospital practice; students enrolling for three months or more in approximately a half-time course of instruction.

The Institute of Laryngology and Otology (Royal National Throat, Nose, and Ear Hospital, Gray's Inn Road, and Golden Square, W.C.1).—A comprehensive full-time course lasting 20 weeks and designed to cover the whole field of the specialty is held twice a year, starting in January and July. A part-time advanced revision course, lasting for ten to twelve weeks, suitable for students preparing for the higher qualifications, is held twice yearly approximately from February to May and from September to November.

The Institute of Neurology (National Hospital for Nervous Diseases, Queen Square, W.C.1).—The teaching is mainly by attendance on the hospital practice, and there are three terms annually. More advanced students are appointed as clinical clerks in the wards or attached to special departments and the research laboratories. In addition to this, two ten-weeks courses, which are whole-time, are held in the autumn and spring terms.

The Institute of Ophthalmology (Moorfields, Westminster, and Central Eye Hospitals).—In addition to the teaching by means of hospital practice, a routine lecture and tutorial course, lasting four or five months, is held twice a year, beginning in March and October. Part I consists of anatomy, embryology, histology, physiology, optics, and elementary clinical instruction. Part II comprises bacteriology, pathology, operative surgery, medical ophthalmology, and all aspects of ophthalmic disease.

The Institute of Orthopaedics (Royal National Orthopaedic Hospital, Great Portland Street, W.1).—The practice of both the central hospital and the country branch at Stanmore is open to postgraduate students. In addition to the hospital practice a comprehensive basic course of six months' duration consisting of lectures and demonstrations begins in October.

The Institute of Psychiatry (Maudsley Hospital, Denmark Hill, S.E.5).—Training normally covers a period of two to three years after adequate experience elewhere in general medicine, and is based on responsible hospital duties under supervision. Regular series of lectures and demonstrations by experts in various fields relevant to psychiatry are given throughout each of the university terms.

The Institute of Urology (St. Peter's and St. Paul's Hospitals, Henrietta Street, W.C.2).—Three courses of fourteen weeks' duration are held annually, beginning in January, April, and September. These include systematic lectures covering the whole subject of urology, out-patient sessions, ward visits, operation sessions, and tutorial demonstrations.

An Institute of Dental Surgery, a dental counterpart to the Institutes of Child Health, etc., has just been set up at the Eastman Clinic. As already noted, an Institute of Obstetrics and Gynaecology is now being formed, combining the department at the Postgraduate Medical School and the combined School of Queen Charlotte's and Chelsea Hospitals. It will start work as an Institute next month.

Facilities in Other University Centres

The following is a not exhaustive list of courses of postgraduate instruction held regularly at universities other than London. All are full-time courses, except those of neurology at Birmingham, psychiatry at Manchester, and the 12-months course for the D.P.H. in the University of Wales, which are part-time.

Subject	University	Duration	Starts
Anaesthetics	Bristol	2 weeks	April and Oct.
	Oxford	2 ,,	Mar. and Sept.
Bacteriology	Manchester	9 months	Oct.
Industrial health	Birmingham	4 weeks	Each univ. term
	Edinburgh	9 months	Oct.
	Glasgow	9 ,,	,,
	Manchester	9 ,,	,,
Medicine (general)	Edinburgh	12 weeks	April and Oct.
	Glasgow	8 ,,	,, ,,
Neurology	Birmingham	2 months	Continuous during univ. terms
Obstetrics and gynaecology	Glasgow	3 weeks	May and Nov.
Ophthalmology	Birmingham	6 months	Jan. and July
Orthopaedic surgery	Liverpool	15 ,,	Oct.
Physical medicine	Bristol	5 ,,	Sept.
Psychiatry	,,	10 weeks	,,
	Edinburgh	5 ,,	Oct.
	Leeds	3 terms	,,
Public health	Aberdeen	9 months	,,
	Birmingham	9 ,,	,,
	Bristol	9 ,,	,,
	Durham	9 ,,	,,
	Edinburgh	9 ,,	,,
	Glasgow	9 ,,	,,
	Leeds	9 ,,	,,
	Liverpool	9 ,,	,,
	Manchester	9 ,,	,,
	St. Andrews	9 ,,	,,
	Wales*	3 ,,	,,
	,,	12 ,,	Jan.
Radiodiagnosis	Birmingham	18 ,,	Oct. (alternate years)
	Bristol	18 ,,	Oct.
	Edinburgh	18 ,,	,,
	Glasgow	18 ,,	April and Oct.
	Liverpool	2 years	Oct.
	Manchester	18 months	April
	Sheffield	18 ,,	Oct.
	Wales	18 ,,	,,
Radiotherapy	Birmingham	2 years	Oct. (alternate years)
	Bristol	2 ,,	Oct.
	Edinburgh	2 ,,	,,
	Glasgow	2 ,,	April and Oct.
	Liverpool	2 ,,	Oct.
	Manchester	2 ,,	April
	Sheffield	2 ,,	Oct.
Surgery (general)	Edinburgh	5 months	Mar. and Oct.
	Glasgow	8 weeks	April and Oct.
	Liverpool	9 months	Oct.
Tropical medicine	Edinburgh	2 terms	,,
	Liverpool	4 months	Jan. and Sept.
Tuberculosis	Wales	6 ,,	Jan.

* For C.P.H. (Wales), preliminary to D.P.H.

Other Postgraduate Arrangements

The West London Hospital Medical School, which during the past eleven years has accepted undergraduate students for the clinical part of the medical curriculum, is now, after

prolonged negotiation with the University of London, shortly to join the British Postgraduate Federation, in which its future work will be the training of specialists in general medicine and general surgery. With this in view the hospital has been grouped with the Hammersmith and St. Mark's Hospitals as one of the designated teaching hospitals under the National Health Service Act. For the time being the West London Hospital Medical School and the British Postgraduate Medical School will operate independently, but the West London will not accept any undergraduate students after October. So far as can be foreseen, it will be possible to admit a small number of postgraduate students in the summer of 1949 and to replace an undergraduate by a postgraduate community entirely by 1952.

At Cambridge the School of Postgraduate Teaching and Clinical Research is well on its way. A successful innovation has been the establishment of trainee posts in the clinical pathology department of Addenbrooke's Hospital. These posts, which carry a "living wage," offer two years' training in all aspects of clinical pathology, post-mortem work, histology, and chemical pathology.

Postgraduate teaching in the University of Liverpool offers full-time courses for the degrees of Ch.M., M.Ch.Orth., and M.Rad., granted by the University, and for the diplomas of D.P.H. and D.T.M.&H., the latter in conjunction with the Liverpool School of Tropical Medicine. These courses are also suitable for candidates studying for the F.R.C.S. and D.M.R.E. examinations. There is a new full-time course in anaesthesia, lasting one year, commencing in October, and a course throughout the academic year for postgraduate students proceeding to the degree of M.D., which is usually attended by candidates for the M.R.C.P. A part-time course of obstetrics and gynaecology is held throughout the academic year, beginning in October, and a short intensive course in paediatrics lasting three weeks and suitable for candidates studying for the Diploma in Child Health is held once or twice a year. The course in radiodiagnosis lasts two years, not eighteen months as formerly.

At Leeds a feature of postgraduate work is weekly clinical meetings for general practitioners and clinical week-ends at intervals on special subjects. A 14-days refresher course for general practitioners is planned. A postgraduate committee is in charge of these activities and of the Ministry of Health scheme for demobilized medical officers. Middlesex Hospital, London, holds one course a year for the primary Fellowship examination of the Royal College of Surgeons. It also provides special courses for graduates for the diplomas in medical radiology, both diagnostic and therapeutic.

The Faculty of Radiologists (45, Lincoln's Inn Fields, W.C.2) offers a Fellowship (F.F.R.) to medical graduates of five years' standing who have spent at least one year in general clinical work at an approved hospital, hold a radiological diploma, and have practised radiology exclusively for at least two years subsequent to obtaining that diploma. Candidates are required to pass an examination and submit a thesis. Those holding higher qualifications may be exempted from examinations in general medicine, surgery, or pathology. Full particulars may be obtained from the Warden.

Apart from London, Edinburgh has probably more postgraduate courses than any other centre. These include general medicine and surgery, industrial health, psychiatry, etc. Particulars from the Director, Postgraduate Board for Medicine, Edinburgh. In Dublin, with the co-operation of the ten teaching hospitals, the Royal College of Surgeons in Ireland has arranged a postgraduate course in surgery.

The Royal Colleges

The Royal College of Physicians of London holds a series of lectures for postgraduates on advanced clinical subjects. The lecturers are specially distinguished in their respective fields, and are drawn from the provinces as well as London. The audience for these lectures, which are given four times a week and will be continued apart from vacations, is limited to 200. A short full-time intensive course in paediatrics is also given. Details can be obtained from the Registrar of the Royal College, Pall Mall East, S.W.1.

The Royal College of Surgeons of England (Lincoln's Inn Fields, W.C.2) has instituted a number of postgraduate courses in various subjects—surgery, anaesthetics, dental surgery and anatomy, applied physiology, and pathology. The programme of lectures on general, oral, and dental surgery includes 34 during the month of September alone. Lectures on surgery to be delivered at the College during October number 12, each by a different lecturer. In the same month 45 lectures on anaesthetics are to be given—three daily—and a series of tutorials in anaesthetics will be held during the same period. From October to December 72 lectures in anatomy, applied physiology, pathology, and pharmacology have been arranged. From January, 1949, there will be residential accommodation available within the College for postgraduate students. Many lectures are also given at the other Royal Colleges and Corporations.

The Royal Cancer Hospital (Free)(Fulham Road, S.W.3) offers facilities to postgraduates for the study of cancer. Courses of instruction extending over a period of two years are given for candidates preparing for the diploma in medical radiology. In addition short courses of instruction are given in radiotherapy extending over periods from two weeks to two months. Facilities are offered to postgraduates to attend the out-patient department, wards, and operation theatres; courses of lectures in the diagnosis and treatment of cancer are also arranged. Appointments as honorary clinical assistant are available for suitable candidates. Courses of instruction are given in clinical and operative surgery for postgraduates preparing for the final F.R.C.S. examination. The department of pathology participates in this course and also in the course of the D.M.R. examinations, and individual postgraduates are accepted, when possible, for special tuition and research work. The Chester Beatty Research Institute is exclusively devoted to experimental investigations on cancer, and facilities are provided for suitably qualified workers studying for a higher degree.

At Middlesex Hospital special courses are provided for graduates for the diplomas in medical radiology, both diagnostic and therapeutic. One course a year is held for the primary F.R.C.S. examination.

For many years the Fellowship of Postgraduate Medicine (1, Wimpole Street, W.1) has administered a bureau providing general information on postgraduate work and arranging courses of instruction at hospitals. Practitioners from overseas visiting London can be advised as to postgraduate facilities by the Empire Medical Advisory Bureau, recently set up by the B.M.A. at Tavistock Square.

ENTRANCE INTO MEDICAL TRAINING

Students' Registration

Every candidate for registration as a medical student must, by regulation of the General Medical Council, produce evidence that he has attained the age of 17 and has passed an approved examination in general education and, in addition, an examination in elementary physics or chemistry conducted or recognized by one of the licensing bodies. He is required to have passed in English, a language other than English, elementary mathematics, and an additional subject or subjects, such as history, geography, physical science, natural science, and Latin or some other language recognized by the university for the purpose. Subject to this condition, the General Medical Council recognizes responsions of Oxford University, the previous examination of Cambridge, the matriculation examinations of other universities of England and Wales, and the equivalent examinations of the Scottish and Irish universities, also all examinations accepted by one or more of the universities or other bodies as equivalent, for the purpose of entrance or matriculation, to their own. These include the school and higher school certificate examinations of the Oxford Delegacy for local examinations, the Cambridge local examinations, the examinations of other universities, and the leaving certificate examination of the Scottish Education Department. The examinations of Colonial universities which are similarly accepted by one or more British universities for the purpose of matriculation will also be recognized. The final examinations for degrees in art and science of any home or Dominion university are also recognized.

Deferment

The Ministry of Labour and National Service has directed that preference for admission to medical schools should be

given to those who have served in the armed Forces or have been engaged in approved war work. By regulation deferment is granted only to male students born between Oct. 1, 1929, and July 31, 1930 (both dates inclusive), who have been selected by the joint recruiting board of the appropriate university. Joint recruiting boards will be unable to consider applications from men in this age group who intend to enter the university after October, 1948. The above statement is made on the assumption that the regulations of the Ministry of Labour will remain the same as those for students in the previous age group—that is, Oct. 1, 1928, to Sept. 30, 1929.

Any male student born between Aug. 1, 1930, and July 31, 1931, who at the time of his registration under the National Health Service Acts is in residence at a university or has been provisionally accepted for admission, should apply to the appropriate joint recruiting board for provisional deferment as soon as possible after registration. If he is granted deferment he will be called up on completion of his course, when he will serve in a medical capacity. Applications for deferment have to be made in duplicate to the secretary of the University Joint Recruiting Board on Form Misc. 20, to be obtained from the school, and forwarded by the date fixed by the Ministry of Labour.

The Student at Oxford

It may be useful to follow the course of a student at Oxford. To attend the course he must be a member of the University, and for this purpose he must be accepted by one of the collegiate or non-collegiate societies already referred to (p. 486) and must pass or be exempted from the University entrance examinations, responsions, in which Latin is normally compulsory. There is, however, some relaxation of the responsions requirements for those who have spent not less than six months on approved war service. Owing to the limited number of places in the Medical School a prospective student, after he has been accepted as a candidate for admission by a college, must be considered and accepted by the University committee set up to select the students who are to make up the quota of 65 for the given year.

After having got over this hurdle he is eligible to go into residence and is qualified for admission into the Medical School, and therefore for deferment of military service—subject to satisfactory periodical reports on his progress—by the joint recruiting board. Before beginning work for the first B.M. examination, however, he must pass certain preliminary examinations in natural science—subject 4 (biology), or subject 3 (chemistry), or subject 5 (physics and chemistry). These preliminary examinations can be taken either from school or after the student has gone into residence at Oxford.

The subjects for the first B.M. are organic chemistry, human anatomy, biochemistry, and physiology. The course in the first of these is open to students who have passed the preliminary examinations in physics and chemistry—in other words, it can be pursued by those who still have to pass biology. About two clear years are required for the study of human anatomy, biochemistry, and physiology, and the student must pass these subjects simultaneously in the examination at the end of the course. By statute no one can take the B.M., B.Ch. degree unless he has first taken a B.A. degree, the course usually chosen for this being the Final Honour School of Animal Physiology. Candidates who take subject 5 (physics and chemistry) as one of the preliminary examinations for admission to the Final Honour School of Animal Physiology must reach the higher standard in both physics and chemistry.

The student next prepares for the second B.M., in which the subjects are pharmacology and principles of therapeutics, general pathology and bacteriology, forensic medicine and public health, special and clinical pathology, medicine, surgery, and midwifery. Most students, even those not intending to do their clinical work at Oxford, find it convenient to take the courses in general pathology and bacteriology, and pharmacology and principles of therapeutics, at the University. Students who carry out their clinical work at Oxford must complete the courses in these subjects before entering the clinical school at Radcliffe Infirmary. The clinical course extends over a period of approximately thirty-three months. Unless a candidate is already a registered medical practitioner the examination in medicine, surgery, and midwifery cannot usually be taken until the eighteenth term from university matriculation.

All the universities, following the results of examination, confer qualifying bachelor degrees in medicine and surgery. The abbreviations are: B.M., B.Ch., Oxford; M.B., B.Chir., Cambridge; M.B., B.S., Durham and London; M.B., Ch.B., other English and Scottish universities; M.B., B.Ch., University of Wales, Queen's University, Belfast, and National University of Ireland. The baccalaureate in medicine and surgery and the licence in medicine and surgery of the University of Durham both admit primarily to the *Register*.

The English Conjoint

The qualifying diplomas L.R.C.P.Lond., M.R.C.S.Eng. were taken by about one-fifth of those who qualified last year. Candidates are examined by the Examining Board in England of the Royal Colleges (Examination Hall, Queen Square, W.C.1). Three examinations have to be passed: a pre-medical examination; a first examination in anatomy, physiology, pharmacology, and materia medica; and a final examination in pathology and bacteriology, medicine, surgery, midwifery, and gynaecology. Candidates are required to complete the medical curriculum extending over not less than fifty-four months of study at recognized medical schools and hospitals, and to pass the professional examinations in accordance with the regulations after passing any two parts of the pre-medical examination. The Board does not itself conduct the preliminary examination in general education but recognizes a number of matriculation examinations and school-leaving certificates.

The examinations of the Board are conducted four times a year, and candidates are required to give notice to the secretary of the Board twenty-one days before the examination. The first medical examination is in two parts: (1) anatomy and physiology, written, oral, and practical; and (2) pharmacology and materia medica, oral only. In the final examination, medicine, surgery, and midwifery and gynaecology are written, clinical, practical, and oral; pathology is written and oral only, and may not be taken alone as the last part of the examination.

Candidates who produce evidence of not less than twenty-four months' recognized clinical study subsequent to passing in anatomy and physiology are admissible to any one part only of the examination; on the completion of twenty-seven months' study they are admissible to one or two further parts, or to three parts if presenting themselves for the first time. Candidates may not enter for the first part of the examination until they have completed thirty months' clinical study.

Before admission to the final examination candidates must show that they are at least 21 years of age and must produce evidence (1) of having attended certain specified courses at a recognized medical school and hospital; (2) of general outpatient and in-patient attendance at a hospital during thirty months, six months' medical clinical clerkship, six months' surgical dressership, and three months' gynaecological clerkship; (3) of attendance at five labours by a teacher or member of the staff of an approved hospital and of having subsequently conducted fifteen other labours; (4) of having received instruction in children's diseases and the care of infants, and in the eye, throat, nose, and ear, and skin departments of general hospitals or at special hospitals; and (5) of having received instruction in venereal diseases, radiology, and vaccination, and of having attended courses, including clinical demonstrations, at a fever and at a mental hospital.

The Scottish and the Irish Conjoint

The Royal College of Physicians of Edinburgh, the Royal College of Surgeons of Edinburgh, and the Royal Faculty of Physicians and Surgeons of Glasgow have made arrangements by which, after one series of examinations, held in Edinburgh or in Glasgow or in both Universities, students may obtain diplomas of the three co-operating bodies (L.R.C.P., L.R.C.S.Ed., L.R.F.P.&S.Glas.). Each of these corporations grants its single diploma after examination, but the single diploma does not confer the right to qualifying registration; it is only a qualification additional to those already on the *Register*. The course of professional study embraces a certified period of not less than five academic years, in the last three of which clinical subjects must be studied. The first examination embraces physics, chemistry, and biology; the

second, anatomy and embryology, and physiology, biochemistry, and biophysics; the third, pathology, materia medica, and pharmacology. The final examination consists of two parts; the first part forensic medicine and public health, and the second part medicine, surgery, and obstetrics and gynaecology. All candidates at the final examination must also produce certificates of efficiency in the practice of vaccination from a Government teacher in the United Kingdom. Candidates for the Scottish Conjoint may work at any of the medical schools of Great Britain and Ireland. Details may be obtained from the Registrar, 18, Nicolson Street, Edinburgh, 8.

The Conjoint Board of the Royal College of Physicians of Ireland and the Royal College of Surgeons in Ireland issues a joint licence in medicine, surgery, and midwifery (L.R.C.P.I.&L.M., L.R.C.S.I.&L.M.), and accepts candidates from most of the medical schools at home and overseas. Regulations are obtainable from the secretary of the Conjoint Board, Royal College of Surgeons, St. Stephen's Green, Dublin.

Other Diplomas

The Society of Apothecaries of London (Apothecaries Hall, Black Friars Lane, E.C.4) grants the diploma of Licentiate in Medicine and Surgery (L.M.S.S.A.Lond.) to candidates who pass in the primary examination, which is held quarterly, and the final examination, which is held monthly except in September. The minimum period of study is normally five years.

The Apothecaries Hall of Ireland (95, Merrion Square, Dublin) grants L.A.H.Dubl. to those passing the three professional examinations.

Diplomas in medicine and surgery registrable in the Colonial List are those granted by the Universities of Sydney, Queensland, Adelaide, and Melbourne, Ceylon Medical College, University of Hong Kong, Royal University of Malta, Newfoundland Medical Board, University of New Zealand, Universities of South Africa, Capetown, and the Witwatersrand, and the King Edward VII College of Medicine, Singapore. Under certain conditions diplomas of colleges in Canada are registrable; also, with some exceptions, and subject to dating, diplomas of the Universities of India and the University of Rangoon.

Higher Qualifications

All universities confer on graduates holding a bachelor's degree the higher qualification of Doctor of Medicine or Master of Surgery. Durham offers Doctor of Surgery, and Liverpool Master of Orthopaedic Surgery (M.Ch.Orth.). The Irish universities offer the degree of Master of Obstetrics (M.A.O.). The requirements of the universities vary, and particulars should be obtained from the one selected. To obtain the D.M. of Oxford a thesis satisfactory to the Board of the Faculty must be presented; the degree of M.Ch. is conferred on the result of an examination.

The Royal College of Physicians of London confers its Membership (M.R.C.P.) by examination. The pass examination for Membership consists of a written examination in the form of a paper on questions of medical anatomy, pathology, principles of medicine; a paper on questions on the practice of medicine, including the principles of public health, and on psychological medicine; a clinical examination in the clinical wards of a hospital, and oral examinations.

The Royal College of Surgeons of England grants its Fellowship (F.R.C.S.Eng.) to those who pass its primary and final Fellowship examinations. The primary examination, partly written and partly oral, is held in January and July, and the final examination, partly written, partly practical, and partly oral, and including the examination of patients, is held in May and November. Until Jan. 1, 1949, candidates for the examination in general surgery may be admitted to the final examination on producing a certificate of not less than six consecutive months in a resident post in charge of general surgical patients in the wards of a recognized general hospital.

A Fellowship in Dental Surgery

The 1948 edition of the *Dentists Register* is the first to include the Fellowship in Dental Surgery of the Royal College of Surgeons of England as an additional qualification. Dr. E. W. Fish, chairman of the Dental Board, addressing the Board recently, said:

"The institution of this Fellowship is a most welcome landmark in the association of the Royal College with dental surgery—an association which first achieved practical expression when the Licence in Dental Surgery was instituted as long ago as 1859. That the Royal College should have decided to award their Fellowship with all the honour and prestige which attaches to that distinction to dental surgeons who are not graduates or diplomates in general medicine, provided that they can give evidence of advanced knowledge in anatomy, physiology, and pathology as well as in the practice of clinical dentistry, may well prove to have far-reaching effects on dental education.

"It is generally agreed that a training in medicine provides a most liberal and valuable background for the practice of dental surgery, but it has been realized for some time that the increasing complexity of the course of study in general medicine, coupled with the rapid evolution of dental science and practice, had rendered it hardly feasible for most students to achieve the double qualification. Now, however, the difficulty may be resolved, since it is possible for a post-graduate student to obtain the Fellowship in Dental Surgery of the Royal College of Surgeons by distinguishing himself in the clinical practice of his own specialty after he has devoted further study to those particular aspects of general and medical science upon which that practice depends. The medical schools and the science schools will remain an indispensable fount of knowledge for the student who intends to make a career in the academic world of dentistry or in research, but the clinical specialist and teacher is likely to be more attracted by the course of study for the new Fellowship. In this way he will be practising his own specialty while he pursues his studies; the increased knowledge he acquires will be directly related to his clinical work; he will reach his goal in a shorter time, and the pressure on the medical schools will be appreciably relieved."

For this diploma (F.D.S. R.C.S.Eng.) candidates are required to pass a primary and a final examination.

Membership of the Royal College of Obstetricians and Gynaecologists (M.R.C.O.G.) may be applied for by medical graduates who have been registered or eligible for registration for at least three years. The Fellowship (F.R.C.O.G.) is granted to members who are considered to have advanced the science and art of obstetrics and gynaecology. The address of the College is 58, Queen Anne Street, W.1.

The Royal College of Physicians of Edinburgh (9, Queen Street, Edinburgh, 2) examines for Membership four times a year. Only a person who has been for at least three years a Member can be elected to the Fellowship, every proposal for election to which must be signed by four Fellows.

Changes have been made recently in the laws relating to the Fellowship by examination of the Royal College of Surgeons of Edinburgh (Surgeons' Hall, 18, Nicolson Street, Edinburgh). The examination consists of two parts: the first consisting of a written paper and an oral examination in anatomy and physiology and in pathology and bacteriology, and the second consisting of a written paper, a clinical or practical examination, and an oral examination on the principles and practice of surgery and on an optional subject chosen by the candidate from the following: surgical pathology and operative surgery; laryngology, otology, and rhinology; obstetrics and gynaecology; and ophthalmology.

New Fellowship Regulations of Royal Faculty

The Royal Faculty of Physicians and Surgeons of Glasgow grants a Fellowship *qua* physician and *qua* surgeon, and regulations in substitution for the present regulations come into effect on June 1 next.

Candidates for the Fellowship *qua* physician must have been medically qualified for not less than three years and must have been engaged during one of those years in full-time clinical work in a recognized hospital, and have spent two other post-graduate years in medical work approved by the Faculty. The examination consists of written and oral examinations in the principles of medicine and therapeutics and the practice of medicine and medical pathology, and a clinical examination.

For the Fellowship *qua* surgeon candidates must be medically qualified and pass a primary examination and a final. The primary examination comprises written and oral examinations in anatomy and physiology and in pathology and bacteriology. To be admitted to the final examination candidates must have been medically qualified for not less than three years and produce evidence that they have been engaged since qualification for a period of one year in full-time clinical work in a hospital

approved by the Council and a further two years in the study of surgery or its allied sciences. The final examination consists of written and oral examinations in surgery and in surgical anatomy and surgical pathology, and a clinical examination. Alternatively, candidates may submit themselves for examination in obstetrics and gynaecology, or ophthalmology, or oto-rhino-laryngology, the final examination to consist of a written, an oral, and a clinical examination in the special subject and in such medicine and surgery as is related to the special subject. The address of the Royal Faculty is 242, St. Vincent Street, Glasgow, C.2.

The Royal College of Physicians of Ireland (6, Kildare Street, Dublin) grants Membership on the result of an examination taken in two parts: the first part being in general medicine and pathology, and the second in one of eight special subjects.

Two examinations—primary and final—are also required for the Fellowship of the Royal College of Surgeons in Ireland (St. Stephen's Green, Dublin). The first is in anatomy, physiology, and pathology; and the second in surgery. A one-year course for the primary starts in October each year and lasts three terms. There is also a postgraduate course in surgery arranged by the College with the co-operation of ten Dublin teaching hospitals.

The Society of Apothecaries of London conducts the examination of Master of Midwifery (M.M.S.A.), embracing antenatal care, midwifery, and infant welfare and their relation to hygiene and preventive medicine. The examination, which is written, oral, and clinical, is held in May and November.

THE COST OF MEDICAL EDUCATION

The fees charged at medical schools are not on any uniform basis. One estimate of the average cost of training, over six years, including books and instruments, is between £320 and £360, but tuition fees tend to rise, and so do examination fees in some instances. The figure named would cover the first M.B. in the case of degree students and the pre-medical examination in the case of students reading for the Conjoint.

Some detailed figures are given in the latest prospectus of the Leeds School of Medicine, which show an approximate total cost of the medical course for the M.B., Ch.B. degree as £405 10s. This is made up as follows:

	£	s.	d.
Examination for matriculation and registration fee	4	0	0
Composition fee (paid by instalments)	265	0	0
Maternity hostel fee	35	15	0
Examination fees	18	0	0
Books, instruments, etc.	75	15	0
Graduation and Convocation fee	7	0	0

The composition fees, which include Union fees, are payable at the beginning of each of the sessions from the first to the fifth in sums of £50, and at the beginning of the sixth, £15. This fee of £265 for the medical course if paid in one sum at the beginning is reduced by £10. All students are required to go into residence at the university maternity hostel for a period of approximately twelve weeks, and the fee is £35 15s. for a single room. The approximate cost of instruments and books which the student must purchase during his course is considered to be as follows: 1st year, £18; 2nd year, £21; 3rd year, £14; 4th year, £5; 5th year, £2; 6th year, £2. On admission to the degree the graduate is required to pay a fee of £7 to entitle him to registration as a member of Convocation and to have his name inscribed on the parliamentary register on attaining the qualifying age.

There are of course innumerable awards—scholarships, bursaries, and the like—to assist and encourage the student. To take Edinburgh alone, some 50 entrance bursaries are tenable in the Faculty of Medicine, and there is a much larger list of fellowships, scholarships, and prizes for which students are eligible. In the Faculty of Medical Sciences, University College, London, there are six scholarships (value £200 each) awarded annually, known as the anatomy and physiology (B.Sc. degree) scholarships, tenable for one session immediately following the second M.B.

The taking of higher qualifications involves further fees. The fee payable for admission to the primary examination for the Fellowship of the Royal College of Surgeons of England is 8 guineas, and to the final examination, 15 guineas. In addition, before the diploma is granted, Members of the College (those holding the L.R.C.P., M.R.C.S.) pay 10 guineas and other candidates 30 guineas.

By the new rules of the Royal College of Surgeons of Edinburgh a candidate for the Fellowship pays an examination fee of 10 guineas for Part I and 20 guineas for Part II. After having passed in both parts of the examination he lodges a petition for his name to be placed for election as a Fellow and pays 25 guineas to the College funds. The fee paid by a candidate in the Membership examination of the Royal College of Physicians of Edinburgh is 35 guineas; when raised to the rank of Fellow he pays 38 guineas, exclusive of stamp duty. Under the new regulations shortly coming into force for the Fellowship *qua* physician and *qua* surgeon of the Royal Faculty of Physicians and Surgeons of Glasgow the fee for admission to the examination for Fellowship *qua* physician is 15 guineas, and the fee payable on admission to the Fellowship is 35 guineas. For the Fellowship *qua* surgeon the fee for admission to the primary examination is 8 guineas, to the final examination 15 guineas, and to the Fellowship 30 guineas.

Fees for special diplomas vary greatly. For the Diploma in Anaesthetics (R.C.P.Lond., R.C.S.Eng.), the examination for which is now in two parts, the fee for admission to each part is 6 guineas, and 5 guineas is also payable before the diploma can be granted. In Edinburgh the fee for the primary examination for the D.P.H. is 6 guineas, and for the final examination 10 guineas; for the D.T.M.&H. of the Incorporated Liverpool School of Tropical Medicine the fee for admission to the examination is 6 guineas and for the diploma 3 guineas. The class fees for the D.P.H. in Edinburgh are 16 guineas for the primary course (one term) and 32 guineas for the final course (two terms). For the course in tropical medicine and hygiene at Liverpool the fee is 40 guineas.

MILITARY SERVICE AND OTHER SERVICES OVERSEAS

Training for Army Posts

Civilian doctors and released medical officers who have held a non-permanent commission in the R.A.M.C. during the emergency and were released before Oct. 24, 1947, will be considered for appointment to short-service Regular Army commissions in the R.A.M.C. for a period of eight years, the first four years of which will be on the Active List and the remainder on the Regular Army Reserve of officers. Civilian doctors will have direct appointment in the rank of lieutenant, and released medical officers, in certain conditions, in the rank of captain. Candidates must be not normally over 30 years of age, British subjects whose parents were British, and registered under the Medical Acts. During the last fifteen months of their service on the Active List they will be considered for appointment to a Regular Army commission, and if they do not want or are not selected for such commission they will receive, at the end of their four years' short service on the Active List, a gratuity of £600. Conditions of service and forms of application can be obtained from the Assistant Director-General, Army Medical Services (A.M.D.1), 38, Hyde Park Gate, S.W.7.

On the nomination of the Central Medical War Committee (B.M.A. House, London) doctors are appointed to emergency commissions in the rank of lieutenant. During their service they can apply for a short-service Regular Army commission and be subsequently considered for a permanent commission under the conditions stated above.

Officers commissioned in the R.A.M.C. may receive their postgraduate service training at the Royal Army Medical College, Millbank, S.W.1. Here a senior officers' course is held twice yearly. Formerly courses were also held for junior officers, but these are in abeyance for the time being. The senior officers' course is divided into three parts. The first consists of tropical medicine and entomology, military surgery, pathology, military hygiene, and psychiatry. The second consists of clinical instruction in medicine and surgery at London teaching hospitals and in specific fevers at the Brook Hospital, Woolwich. At the end of the first and second parts examinations are held, and thereafter officers are selected for training in the specialist subject for which they are best qualified or show aptitude. The third

part thus consists of specialist subjects to be undertaken by such officers as have qualified for further study in the preceding part of the course.

The instruction in tropical medicine at the College includes a course of lectures and clinical demonstrations; instruction in entomology is also given. The modern military surgery taught includes general and regional. Surgery of tropical diseases has its place in the syllabus, and stress is laid on the influence of tropical diseases on the management of surgical conditions in the soldier, both at home and abroad. The facilities offered by a small but very adequate department of anatomy, together with an excellent library of reference works and journals, are of great value to officers under instruction.

In the teaching of pathology the syllabus of lectures is designed to cover the subjects taught in the classes of tropical medicine, surgery, and hygiene. Specialists in pathology receive their first six months' training at the College, except for the performance of necropsies. The syllabus includes separate courses of lectures and practical instruction in bacteriology in its widest sense, serology, haematology, biochemistry, histology and histopathology, protozoology, and helminthology. For selected officers a further six months' training in a chosen branch of their subject is arranged with various civil institutions. The pathology department also maintains the Army tumour registry, in which specimens of all tumours occurring in Army personnel, with reports as to their nature and histology, are maintained for future reference.

The hygiene department of the College, in addition to the teaching of hygiene, has facilities for the carrying out of research of importance to the Army from the hygiene point of view. Well-equipped laboratories of adequate capacity exist for instruction in hygiene laboratory work of all kinds. There is also a well-organized hygiene museum. The College is now recognized as a teaching institution for the C.P.H. and the D.P.H. awarded by the Conjoint Board, and officers taking a specialist course in hygiene have the opportunity of taking the D.P.H. and the D.T.M.&H., for which most of the instruction is given at the College.

The course in psychiatry consists of lectures partly on clinical psychiatry and psychopathology and partly on the applications of psychological principles to morale, discipline, personnel selection, and other purely military matters. There are also demonstrations on clinical cases held at Banstead and Sutton Hospitals, and demonstrations of selection tests by a personnel selection officer. The school of radiology in the College affords ample material for teaching radiological diagnosis to officers taking the course.

There is no need of the reminder that military medicine is the pioneer in the preventive field. The most important movements in preventive medicine during the eighteenth century, alike in Great Britain and other countries, were initiated by military and naval surgeons.

The Colonial Medical Service

The Colonial Medical Service offers an interesting career and provides exceptional opportunities for applying medical science in all its branches in territories which are undergoing rapid development. Medical officers are usually appointed in the first instance for general duties, which require all-round ability and a balanced outlook on both preventive and curative medicine. There are also openings for doctors who hold the D.P.H. or who have had previous experience in health work. In addition ample scope exists for research and field investigation, and officers who possess special interests and aptitude are encouraged to obtain such higher qualifications as will enhance their value to the Service. Appointments to the super-scale posts in the administrative and specialist grades are invariably made by promotion of officers in the Service who possess the necessary qualifications and experience. Full details regarding conditions and terms of service may be obtained on application to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, London, S.W.1.

A limited number of research studentships were instituted in January, 1947, by the Secretary of State for the Colonies for graduates in medicine and cognate sciences who desire by this means to prepare themselves for research work in tropical medicine and related subjects. A graduate awarded a studentship is eligible for a maintenance allowance, assessed according to personal circumstances. The maximum rates of allowance are £300 per annum at the Universities of Oxford, Cambridge, and London, and £260 per annum at other universities in the United Kingdom. The allowance is free of income tax. A studentship is normally awarded for a period of two years, subject to a satisfactory report at the end of the first year's work from the supervisor nominated by the Colonial Medical Research Committee.

Salaries, cost-of-living allowances, etc., in the Colonial Service differ very considerably from colony to colony. The East African and Far Eastern salary scales are still in process of adjustment.

Medical Missions

To medical men and women with a sense of vocation medical missionary service offers great opportunities. In China, Christian missions have given the country a medical profession. In India and Pakistan they have helped to maintain high ethical and professional standards. In Africa they have pioneered rural health services and the training of subordinate staff. For undergraduates intending missionary service hostels are available in London and Edinburgh, also various scholarships. With regard to postgraduate studies, at least eighteen-months or two-year appointments are advised for all, and special diplomas or higher degrees for some. Some societies in addition require special missionary training. Offers for life service are expected, but short terms are considered. Terms may be of from two to six years, according to country or climate, with opportunities for postgraduate study during furloughs. Salary is on a missionary subsistence basis, with allowances, free passages and quarters, and pension provision. There are schools for missionaries' children at home and in many of the fields.

Applications from students or qualified men and women should be made either to the secretary of one of the denominational or interdenominational missionary societies, or through the local branch of the Student Christian Movement or the Intervarsity Fellowship, or to the Chairman of the Medical Advisory Board of the Conference of British Missionary Societies, Edinburgh House, 2, Eaton Gate, S.W.1.

ORGANIZATIONS TO JOIN

The newly qualified practitioner should immediately take steps after registration to join the British Medical Association and one of the defence organizations. Even if he is not in independent practice, but in a salaried position, perhaps in the service of a public authority, he will do well, by joining one or other defence society, to protect himself against the medico-legal hazards which even the most careful practitioner may encounter.

The Medical Protection Society (long known as the "London and Counties") (Victory House, Leicester Square, W.C.2) has a membership of or approaching 25,000. During the past year it has gained over 1,500 new members. Membership is open to any registered medical or dental practitioner. This Society was the first to afford indemnity against adverse costs and damages, the first also to afford unlimited indemnity.

The Medical Defence Union (49, Bedford Square, W.C.1) is the oldest medical defence organization in the country. It has over 32,000 members and has expended, since its inception, more than £323,795 in fighting and settling cases on behalf of its members. In 1947 the cases conducted by the Union numbered in all 1,586.

The Medical and Dental Defence Union of Scotland (113, St. Vincent Street, Glasgow, C.2) has a membership of some 6,000.

The annual subscription of all these societies is £1, with an entrance fee of 10s.

The British Medical Association

The British Medical Association, with which the Canadian Medical Association and the Medical Association of South Africa are affiliated, has a membership of about 58,000. In the United Kingdom three-fourths of the members of the working profession are in the B.M.A. Members are elected by the Council of the Branch in the area in which they reside, or, if not resident in a Branch area (for example, serving with H.M. Forces), by the Central Council. The privileges of membership include participation in all activities of the Association,

local and central, in its government and the formulation of its policy; the receipt weekly of the *British Medical Journal* and its *Supplement*; the use of the houses of the Association (Tavistock Square, London, W.C.1, and 7, Drumsheugh Gardens, Edinburgh); and the help of the central staff in professional matters. The Association awards a number of prizes for research and the encouragement of important work. Six prizes, each of the value of £25, are awarded annually to medical students for essays submitted in open competition on a national basis, and £150 has been allocated for the award of regional essay prizes to medical students based on the four regions of the British Medical Students' Association. The Association also has certain research scholarships which are awarded for a period of twelve months to accord with the academic year.

One of the latest developments in the Association is the establishment of an Empire Medical Advisory Bureau to assist members of the profession coming to this country from the Dominions and Colonies for postgraduate instruction and other purposes. The Bureau, now opened at B.M.A. House, provides a personal advisory service to visiting practitioners, and one of its principal objects is to make available the fullest information regarding facilities for postgraduate study and, where necessary, to provide the required contacts and introductions.

The ordinary subscription to the B.M.A. for members resident in Great Britain and Northern Ireland is 3 guineas, but newly qualified practitioners are admitted to membership within two years of registration on a subscription of 1½ guineas, which continues until the end of the fourth year after registration, and the subscription is 2 guineas for members of not less than forty years' standing, for members of not less than ten years' standing who are retired from practice, and for members not engaged in practice who are engaged whole-time in teaching or in research as distinct from routine laboratory work.

The Students' Association

The British Medical Students' Association was founded in 1941 to promote the interests of medical students. It provides a method of communication between medical students of the various schools and regions and between British and foreign students. It publishes a journal, and has issued a catalogue of medical films. It has organized a number of clinical conferences in university centres, and its greatest and most successful effort in this direction was its organization of an International Medical Students Conference which took place, over a period of almost three weeks, successively in London and at Oxford and Birmingham, in July. The B.M.S.A. was ably represented on the Curriculum Committee of the British Medical Association which recently reported, and tributes were paid in the Council of the B.M.A. to the value of the contribution made by its representatives. It holds an annual meeting in London, usually extending over three days, and depends on local enthusiasm for its activities in the various schools. Recently it has created a new category of membership for qualified men and women, so that students who leave the student ranks on qualification need not necessarily feel themselves cut off from the student body. The offices of the Association are at B.M.A. House, Tavistock Square, W.C.1.

SPECIAL DIPLOMAS

Diploma in Public Health

The Diploma in Public Health (D.P.H.) of the Conjoint Boards and the various universities is registrable with the General Medical Council. The preliminary and final examinations for the D.P.H. under the English Conjoint Board are normally conducted twice yearly—in June and December—and candidates must give notice to the secretary of the Examining Board, Examination Hall, Queen Square, W.C.1, twenty-one days before the examination takes place, and must furnish the necessary certificates. In Edinburgh University the final examination is held in July and October.

The preliminary examination includes written and oral examinations in the history of public health, the functions of central and local authorities, social security, international health organizations, nature and sources of information bearing on the health of the people, causal agents of infection and their sources of control, influence of environment on physical and mental health, physical education, influence of heredity on health, and principles of health education. The final examination includes written examinations in physiology and biochemistry; food and nutrition as applied to public health; bacteriology, parasitology, and medical entomology as applied to epidemiology; mass aspects of disease; sanitation, etc.; statistical data and methods; the law relating to public health; mental health services; occupational health; and a number of other subjects; also a clinical examination in infectious diseases and an oral examination in infectious diseases, epidemiology, and general and special hospital administration.

The London School of Hygiene and Tropical Medicine (Keppel Street, W.C.1) arranges courses for the D.P.H. designed primarily for those who intend to enter the public health service in this country as medical officers of health. The course lasts one academic year of nine months. Examination for the certificate is held at the end of three months.

The Royal Institute of Public Health and Hygiene (28, Portland Place, W.1) arranges courses of lectures and laboratory instruction by qualified teaching staff. Students completing the course are entitled to enter for examinations for the diploma of the universities and corporations.

Diploma in Tropical Medicine and Hygiene

The Diploma in Tropical Medicine and Hygiene of Liverpool University (D.T.M.&H.) has been combined in that form since 1946. Originally there were two separate diplomas. The diploma in tropical medicine was obtained at Liverpool by 978 candidates between 1904 and 1946, and since then the combined diploma has been obtained by 71. The examination is held in January or February and in April or May. The Incorporated Liverpool School of Tropical Medicine furnishes a course for the diploma twice yearly, each course lasting about five months. The examination consists of one paper on tropical medicine, one on pathology including bacteriology, one on parasitology, one on entomology, one on tropical hygiene, and one on sanitary engineering and tropical hygiene, and practical and oral examinations on the first four of these subjects.

Diploma in Industrial Health

For the Diploma in Industrial Health of the Royal College of Physicians of London and the Royal College of Surgeons of England (D.I.H., R.C.P.Lond., R.C.S.Eng.) candidates are admissible to Part I of the examination twenty-four months after having passed the qualifying examination in medicine. Both parts of the examination are taken in June and December unless otherwise ordered. Exemption from Part I may be obtained by those who hold a certificate in public health. The subjects in Part I are the same as in the preliminary examination for the D.P.H. The final examination consists of written papers and oral examinations on (1) the structure of industry, (2) international organizations concerned with public health and the law of industry, (3) industrial psychology, (4) surgery—rehabilitation, and (5) medicine and surgery, dermatology, and ophthalmology applied to industry.

Candidates should note the possibility of additional expense for travel and maintenance, because attendance at factories and mines is required in the final course, and the places selected may be in various parts of the country. The same holds good for those taking the Diploma in Public Health, who are required as part of the final course to attend at the department of a medical officer of health.

The Society of Apothecaries of London holds an examination in industrial health, embracing the history and legislation relating to the subject, occupational diseases, industrial environment, the practice of industrial medicine, and clinical medicine and surgery as applied to industry.

The Royal Institute of Public Health and Hygiene arranges courses for this diploma, and the practical instruction includes visits to industrial establishments, rehabilitation and retraining centres, and works' surgeries, and attendance at a skin and an ophthalmic clinic and at the accident department of a hospital.

Diplomas in Radiodiagnosis and Radiotherapy

Diplomas in this subject are granted by a number of bodies including the English Conjoint. For the Edinburgh diplomas (D.M.R.D.Ed. and D.M.R.T.Ed.) a written examination is held in June and September and the final in September and March.

The course of study, full-time, extends over eighteen months for the Diploma in Radiodiagnosis and two years for the Diploma in Radiotherapy. During the first nine months the candidate attends lectures and receives a course of practical instruction. During the remainder of the time he takes part in the work of the department so as to extend his practical training.

Diplomas in Psychiatry

The English Conjoint and several of the universities have Diplomas in Psychological Medicine. A course for the D.P.M. is normally held at Maudsley Hospital (Denmark Hill, S.E.5) in the early months of the year. The Conjoint Board in Ireland also has a D.P.M. The Diploma in Psychiatry of the University of Edinburgh (D.Psych.Ed.) requires candidates entering for the examination to have spent a period of three years in a duly proportioned training in approved hospitals, clinics, laboratories, and other institutions—eighteen months' whole-time appointment in a mental hospital or psychiatric clinic; six months' whole-time work in a neurological hospital or in the neurological department of a general hospital; six months' training in child psychiatry, including a three months' appointment on the staff of an institution for mental defectives; three months' training in psychology; and three months in the special study of psychiatry or neurology. Candidates can take these different periods in any order they prefer.

Other Diplomas

The above are only examples of the special diplomas granted by the various bodies, and for full information the programmes and prospectuses of the bodies must be consulted. The University of Oxford grants a Diploma in Ophthalmology, the University of London a Diploma in Clinical Pathology, the University of Liverpool the degree of Master of Surgical Orthopaedics. The Conjoint Board in Ireland has Diplomas in Ophthalmic Medicine and Surgery and in Anaesthetics. A Diploma in Anaesthetics is also granted by the English Conjoint (D.A.R.C.P.Lond., R.C.S.Eng.). The examination for this is in two parts, the first part comprising physiology, pharmacology, and clinical pathology, with special reference to anaesthesia and analgesia and anatomy as it applies to these subjects, and the second part, anaesthesia and analgesia, including pre-operative and post-operative treatment and clinical medicine and surgery in so far as it concerns anaesthesia. The English Conjoint also offers Diplomas in Laryngology and Otology, in Ophthalmic Medicine and Surgery, in Child Health, and in Physical Medicine.

COURSES IN PSYCHIATRY

The National Association for Mental Health (39, Queen Anne Street, W.1) arranges training courses in certain aspects of psychiatry, mainly child psychiatry and mental deficiency. For the last seventeen years Fellowships have been given to enable qualified psychiatrists to obtain special training in child guidance at a recognized training clinic. Preliminary qualifications for the award of a Fellowship are the D.P.M., or equivalent experience in the psychoses, psychoneuroses, and mental defect. Fellowships are tenable at a number of training clinics in England and Scotland. The usual course of training covers twelve months, half-time. The course of training is recognized as a suitable qualification for the medical directorship of an education authority's child-guidance clinic.

The Tavistock Clinic (2, Beaumont Street, W.1) has specialized as a centre for the out-patient treatment of children and adults suffering from psychiatric disability. The educational programme includes courses for psychologists and social workers as well as doctors. The twelve-month half-time course for psychiatrists specializing in child psychiatry is organized jointly with the National Association for Mental Health. The number of students accepted for these courses is strictly limited.

The Institute of Psycho-Analysis (96, Gloucester Place, W.1) furnishes a part-time course, lasting about four years, in psychoanalytic theory and technique. It includes a personal analysis, attendance at lectures and seminars, and clinical work under supervision. The Institute does not set out to teach all aspects of psychiatry, and general psychiatric experience must be obtained at other clinics and hospitals. Completion of the course to the satisfaction of the training committee qualifies for election as an associate member of the British Psycho-Analytic Society.

ENTRANCE UPON PRACTICE

The majority of those who qualify will find their way into general practice, probably beginning as assistants. A much smaller number will be found in whole-time posts in hospitals or in the public health service. A smaller number again will become consultants and specialists. The recent Spens Report traced the evolution of the specialist. After holding one or more house appointments he devotes himself to intensive academic study with a view to securing a higher qualification in medicine or surgery, and also with a view to obtaining, about four years after registration, a post which may be variously described as registrar or senior registrar, assistant or chief assistant, for which a higher qualification is normally required. In such a post he is given more and more responsibility, and on completion of his tenure he is ready for appointment to the staff of a hospital, when he will be recognized as having full specialist status. The Spens Committee, by the way, was impressed by the drastic selection to which aspiring specialists are subject; at every stage there is some elimination.

It is not necessary to recapitulate the conditions which the National Health Service imposes on a career in any of these branches of the profession. A summary of such conditions as affecting general practitioners, consultants and specialists, and public health medical officers was set out in the *Supplement* of June 19 (p. 176), and an earlier statement on the remuneration of general practitioners was published in the *Journal* of June 5 (p. 1096). The Report of the Spens Committee on the Remuneration of Consultants and Specialists, whose recommendations the Government has agreed to accept, was published in June and reproduced in the *Journal* of June 12 (p. 1146).

With regard to public health medical officers, the remuneration and conditions of those in the service of local authorities are now under consideration in the light of the Spens Report. Pending the operation of permanent new scales, the recently revised "Askwith" memorandum will continue to have effect. The Council of the British Medical Association is urging upon the Government and local health authorities that the salaries of medical officers of health should be adjusted in the light of the Spens Report. Indeed, it is the intention of the Council that every type of medical remuneration shall be brought into line with the two Spens Reports (general practitioner and specialist); this will apply not only to the public health service but to the Colonial Medical Service and to the medical services in the Armed Forces of the Crown. During the past year the Council has made certain recommendations for the remuneration of whole-time and part-time medical officers employed in industry. These were set out in the *Supplement* of June 19 (p. 179).

Remuneration of Medical Teachers

One point of some importance is mentioned by the secretary of the University of Aberdeen in reply to the usual inquiries about the work of the Medical School in the next session. He says that the report of the Spens Committee has caused some anxiety. There is no difficulty in the case of clinical professors, because the whole-time salary for such posts is already well known, but great difficulties arise so far as whole-time lecturers in the various clinical departments are concerned. According to the Spens Report they should be receiving something like double what they are receiving at the present time. A still greater difficulty for the university occurs owing to the position of professors and lecturers in the medical scientific departments. "It is pretty clear from the history of medical progress during the last fifty years that this has come mainly from the laboratory scientific department, and very little from the clinical side. The university, therefore, regards it as a very serious matter that the holders of chairs and lectureships in medical scientific departments should be paid on a very much lower scale than those in the clinical departments, and is already taking steps to see what can be done to remedy the matter."

The Spens Committee expressed itself as doubtful whether it would be possible to secure the best men for teaching unless a higher total remuneration was offered.

THE PUBLIC HEALTH SERVICE

The public health service has been more widely affected by the changes resulting from the National Health Service Act than perhaps the rest of the profession realize. Hospitals have been transferred to the Regional Hospital Boards, and maternity and child welfare services from the relatively large number of welfare authorities, including non-county boroughs and urban and rural districts, to the local health authorities under the Act—namely, about 150 county borough and county councils. Tuberculosis officers, hitherto employed by local authorities, are now mainly officers of the Regional Boards, though a method of joint appointment whereby they are still employed for part of their time by local health authorities for domiciliary and after-care work is being widely adopted.

Under the pyramidal structure which has always obtained in the public health service the number of chief posts has been relatively small in comparison with the total number of practitioners in the service. The effect of the Act has been to make the number of major posts still smaller, although a number of new types of post are being created. It is too early as yet to say what will be the ultimate shape of the service. Professor J. M. Mackintosh, in last year's Educational Number (Sept. 6, 1947, p. 368), suggested that the loss of hospital services would be an ultimate benefit to the medical officer of health, as it would release him for his more proper duties in the promotion of health, with a return of direct interest in environmental services, especially housing. From the point of view of the medical graduate the public health service at the moment may not appear to offer a very promising career, but it is hoped that forthcoming negotiations on remuneration and conditions of service will result in prospects no worse than those for the general practitioner and the specialist.

The Ministry of Health estimate of the number of practitioners in public health in 1944 gave a total of about 2,000 in whole-time local authority appointments (excluding those in hospitals) in England and Wales. The number is not likely to have altered materially. About 200 whole-time tuberculosis officers have been transferred to the Regional Hospital Boards, but other departments have increased their strength since the war.

The New Entrant

The new entrant into public health work usually begins as assistant medical officer, doing maternity and child welfare or school medical work or both. The future tendency will be for such medical officers to specialize more directly either on the obstetrical or child-health side and to have opportunities of keeping up clinical knowledge by interchange arrangements with hospitals or by clinical assistantships. For these appointments the D.P.H. is not essential, and the Society of Medical Officers of Health has suggested that special experience in maternity or children's hospitals and the acquirement of some specialist diploma such as the D.C.H. may in fact be more useful than the D.P.H. itself. The Society, however, considers that a Certificate in Public Health, which can be acquired as the first part in the D.P.H. curriculum, should be regarded as a basic qualification for anyone entering the public health service.

Above assistant medical officer level there are a number of senior posts defined in the Askwith Memorandum as "medical officers in charge of departments," which carry a higher rate of salary. These posts are, or should be, sufficiently well remunerated to make a career for those who do not aspire to the chief administrative posts as M.O.H. or deputy M.O.H. For these two grades the D.P.H. is a statutory necessity, and the course can be taken at two schools in London or at ten centres in the rest of Great Britain. Thus the public health service will still provide an interesting career for a man or woman interested in the preventive side of medicine, in the acquisition of knowledge of factors which affect the health of the people, and in the promotion of positive health.

For the above statement we are indebted to Mr. G. L. C. Elliston, M.A., executive secretary of the Society of Medical Officers of Health.

Correspondence

Mental Health

SIR,—One cannot help regretting that the recent International Congress on Mental Health, dominated as it was by the psychologists, could not have been more representative of the other social sciences, particularly education. Criticisms were made of teachers—criticisms which it should be said in all fairness could be made against members of other professions—and there was no one to point out that it is not the teaching profession but the educational system which must be revolutionized. There is, I think, little doubt that teachers will remain as they are so long as the educational system remains as it is.

Our upbringing and education, in the home and in the school, can largely obliterate or develop such psychic forces as guilt and aggression, which the Congress considered in relation to world peace. If parents had a greater knowledge of their own physical and psychological make-up it would improve their methods of training their children, and if enlightened teaching along these lines were to be continued in the schools during the formative years one cannot help feeling that eventually there would be little need for specialists in psychology. So far as the schools alone are concerned training in human relationships should play a far larger part than it does to-day. Greater freedom of individual expression—an outlet for thought-energy and word-energy—is certainly as important, and far more important for later life, than the outlet for physical energy provided, for instance, by the traditional school games. It would be well to remember that the team spirit is of value only if it is not obliterated by the competitive spirit, with all its potentialities for developing and perpetuating aggression.

In short, there are many ways in which a drastically reformed educational system could contribute to mental health. In this endeavour the aid of psychologists would be invaluable. Until such a project is undertaken, however, there is little that individual teachers can do. Meanwhile one feels that the medical profession, which was prominently represented among the speakers at the Congress, would make a more positive contribution to human progress if it put its own house in order in the first instance. In the light of the general acceptance today of the psychosomatic conception of medicine, the curricula and the whole method of training students in the medical schools are glaringly outmoded and inadequate. They continue to turn out doctors who have not only little knowledge of psychology but a positive antagonism towards it, and who feel that only one part of the individual is important and relevant—the body.

All illnesses, even if they are not technically psychosomatic, certainly include superimposed mental disturbances. If a person is ill he is totally ill, and there must be twofold treatment—for the condition and for the person with the condition. The danger of too narrow specialization—of failure to take the broad view—is always with us. With our present knowledge of the pervasive interaction of body and mind it is imperative that the G.P. should have a reasonable degree of psychological knowledge.

It would be well for members of the medical profession—in particular, the psychologists—to ask themselves where they are going. Do they want to supplant the teachers, politicians, statesmen, and sociologists? Would it not be better for them to concentrate on improving their own service to the individual and, through him, to the community? Meanwhile they should not try to give the lay public the impression that they alone have panaceas for all the world's problems. A profound knowledge of psychology is not restricted to those trained in it, as many classical and contemporary authors have shown. On the other hand, even the most highly trained psychologist might be nonplussed at confronting thirty or forty unruly, perhaps antagonistic, children in a hopelessly inadequate classroom. One cannot end without a word of praise for the excellent way in which the Congress was organized.—I am, etc.,

London, W.1. EUSTACE CHESSER.

Treatment of Genu Valgum

SIR,—Mr. H. A. Brittain's article (Aug. 21, p. 385) interested me greatly. It has been my lot to see hundreds of cases of genu valgum in orthopaedic inspection clinics each year for many years. My conclusions in regard to treatment agree completely with Mr. Brittain's. For some years I used the splint employed in these cases for walking. It might have been of some use if it had ever been properly applied by the child's parents, but this hardly ever happened.

I am not satisfied that the cause of genu valgum is yet understood. Rickets seems to cause only a small percentage, and in these there is always a varus curve in both femur and tibia, so that the genu valgum is masked by the other curves. Under correct diet these curves disappear first, and then the genu valgum becomes manifest. At least that has been my experience. By the time I see the patient, laxity of the internal lateral ligament is not often present. Of course it may have been present previously, but I am not satisfied that it will explain most of the cases of genu valgum. I have found it quite often in children with straight knees, so it does not always cause genu valgum.

There is another ligament which is very often lax in young children, but far oftener in those with genu valgum than in those with straight knees; this is the anterior cruciate ligament. I find that it is possible to hyperextend the knees of many young children, and that in these cases lateral movement is seldom present. I have not seen this phenomenon mentioned in the literature, and it may be confined to this district, but here it is very common. I do not pretend to explain why a loose anterior cruciate ligament should so often occur in genu valgum. Has the laxity of ligaments been general at first, but lateral movement is no longer possible after the internal lateral ligament has stretched to the limit? This would fit in with Mr. Brittain's view of aetiology. In this area genu valgum tends to "run in families."—I am, etc.,

Hull. J. F. GILL.

The Sphenoid Sinus

SIR,—To hear Dr. A. W. Proetz is always stimulating, but his Cambridge address (July 31, p. 243) leaves the reader confused. His thesis is, "These *newer* conceptions require changing of the rules of sinus treatment and sinus surgery. . . *Newer* methods are based on the better understanding of the cilia and their importance" (my italics).

But what is old and what is new? Dr. Proetz quotes Skillern. In the 1916 edition of Skillern's book[1] the technique of enlarging the ostium is described. A small part of the anterior face of the sinus is removed, working downwards from the ostium. "This will usually suffice to bring about a cure." (Reference might also be made to the teaching of P. Watson-Williams.[2 3]) The importance of the cilia and the method by which they roll mucus along in a ball, with bacteria if present, was shown by Yates[4] in 1924, and had already been emphasized by Skillern (loc. cit., p. 27), P. Watson-Williams,[5 6 7] and Tilley.[8] The following instances are taken from St. Clair Thomson's *Diseases of the Nose and Throat* (1926, 3rd edition, p. 57): "The importance of not injuring the ciliated epithelium . . . all nose lotions should be alkaline and isotonic with the blood plasma. . . . Chemicals applied to the mucous surfaces cannot effect sterilization without destroying . . . the important cilia." Now Dr. Proetz announces as a new conception, "Antiseptics are of small value, partly because they impede ciliary activity . . . any solution employed in the nose should be relatively isotonic."

He states also that "the two mortal enemies of ciliary activity are cocaine and epinephrine," and their daily application in strong solution through the ostium is undesirable. Such a procedure is a startlingly new proposal to me. The greatest concentration of adrenaline that I ever allow in the nose is 1/10,000—I prefer 1/20,000. Cocaine is harmless in isotonic solution (4.8%), and since 1924 I have never used a stronger solution. It is the hypertonic solution that impairs ciliary activity; the effect of cocaine as such is quite transient.

Dr. Proetz states, "It is necessary to distinguish between an abscess and a pus-filled sinus, a distinction not usually made in years past." For "pus-filled" substitute "diseased" and you have verbatim (old students will recognize my insistence) my opening gambit on sinus disease for at least 25 years. Dr. Proetz writes of *drainage* of the sinus; all my teaching life I have made a special point that *ventilation* is the need—to let air in, not to let pus out. The usual complaint is not that discharge cannot escape but rather that it never ceases to escape. With few exceptions the patient whose sinuses contain air will get well without operation. (How often do we see a "fluid level" in the sphenoid?) Only those need operation whose sinuses are completely filled with swollen mucosa, mucus, and/or pus. "Displacement," a variant of Sondermann's "suction," is not applicable in these cases.

Dr. Proetz suggests, when operation is necessary, "a narrow longitudinal (?) opening . . . as close to the septum or the intersinus wall as possible. This narrow opening permits access for observation, ventilation . . ." How many sphenoids can one "observe," except after the surgical crime of conchotomy? How wide is the anterior face of the sphenoid, and how narrow is the opening that permits observation? And how does one know where the intersinus septum lies? Anyone familiar with the surgery of this part will recognize that this "new" procedure is exactly what has been standard here for 30 or 35 years.—I am, etc.,

Bristol, 8. E. WATSON-WILLIAMS.

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Tubercles of the Choroid

SIR,—With reference to the paper by Professor Ronald S. Illingworth and Dr. Trevor Wright (Aug. 21, p. 366), I would like to mention a case which I was able to observe over a period of four months in Bombay during 1947. The patient was an Indian officer, aged 30, with miliary tuberculosis of his lungs. When I first saw him there were several small, fresh, choroidal tubercles in each eye. Shortly after that streptomycin therapy was instituted and the choroidal lesions became older in type, proceeding to small atrophic areas with some pigment around their edges. Unfortunately, supplies of streptomycin were insufficient, so that treatment was several times interrupted, and it was observed that fresh choroidal lesions appeared during the intervals. No further lesions were noted while treatment was being given. In all, about ten patches were found in the right eye and six or seven in the left. When I last saw him he was still undergoing treatment and his general condition had not much improved.—I am, etc.,

Downe, Kent. R. A. D. CRAWFORD.

Peritoneoscopy

SIR,—In regard to his excellent article (Aug. 14, p. 348) on peritoneoscopy Mr. John Hosford may be interested to know that Professor Kalk, of the Hohngatow Hospital, Spandau, Berlin, has made very liberal use of this diagnostic aid for many years and has demonstrated his method to many allied officers since 1945. From what I can remember I believe he makes his distension of the abdominal cavity with sterile air through the cannula on removal of the trocar and then inserts the peritoneoscope through the same cannula; probably there is a valve to prevent exit of air during the procedure. He also, I believe, has seen, on one occasion, the rupture of a Graafian follicle and was hoping to devise a method of taking photographic records of such.—I am, etc.,

London, S.W.2. JAMES MELVIN.

Death in Hypoglycaemia

SIR,—I think the following case of irreversible hypoglycaemia may be worth recording. A man who had been a diabetic for a number of years was found one morning sitting on the floor of his bedroom in a dazed condition. He had not given himself his usual injection of 30 units of zinc protamine insulin. His doctor was called and, diagnosing "diabetic coma," gave him 30 units of zinc protamine insulin. The patient came round and, feeling unwell in the afternoon, gave himself a further 15 units Z.P.I. He felt and seemed quite well when he

went to bed, but his wife was awakened by his stertorous breathing in the night and found that she could not rouse the patient. The doctor was again called and, thinking that he had relapsed into coma, gave him a further 40 units Z.P.I. This time he did not come round and was sent into hospital.

On admission the patient was restless, with a peculiar to-and-fro conjugate roving of the eyes, each excursion taking about five seconds. The breath was free from acetone and the urine contained neither sugar nor acetone. The blood sugar estimated about 12 hours after the last injection of insulin was 28 mg.%. Glucose (6%) was given rapidly by intravenous drip, amounting to 2.8 litres, but the patient did not recover consciousness. Necropsy showed that the cause of the initial collapse was coronary occlusion.

It is possible that the diagnostic blunder made here weighed the balances against the patient recovering from his heart attack by so depleting the blood of sugar for a number of hours that irreversible changes were produced in the central nervous system.—I am, etc.,

Edinburgh. D. STEWART MCLAREN

"Mushroom" Poisoning due to Amanita Phalloides

SIR,—The following quotation is from Dr. Paul White's book (1945) on diseases of the heart: "The mushroom *Amanita phalloides* has been reported to have been the probable cause of temporary right bundle branch block (Hyman 1928)." Dr. David Lewes (Aug. 21, p. 383) also refers to Hyman's report in his article on poisoning due to this fungus.

I do not think that Hyman's patients were suffering from poisoning by *Amanita phalloides*. The course of their illness as he described it was as follows: Three hours after ingestion the four people fell ill with violent abdominal pains, nausea, and vomiting, and two of them had diarrhoea. In one there was an agonizing frontal headache, vertigo, and blinding flashes of green light. After eight hours the abdominal signs in this case had completely disappeared, but he then became stuporose and could be roused only with difficulty. Ten hours after taking the fungus the cardiac irregularity was noticed. Hyman says that a specimen of the mushroom gave the typical silver-spoon reaction. After intravenous administration of glucose for thirty hours the patients were fit for transfer and after a few days they were quite well.

The short incubation period, the benign course, the rapid return to normal health (and, I suspect, the "typical silver-spoon reaction"), all speak against *Amanita phalloides* as having been responsible for the symptoms and the heart block. Indeed, there is nothing to suggest that this fungus had been taken. It is a pity that Hyman's statement is beginning to be taken seriously and apparently without any critical appreciation of the clear report he gives of the clinical condition of his patients.

This is the way that myths arise, and I trust that this one will be scotched before it is copied by even more authors. The only mistake made by Hyman was in identifying as *Amanita phalloides* the fungus which made his patients ill. It would be interesting if Dr. J. Ramsbottom would give his opinion on this matter.—I am, etc.,

Bristol. J. A. R. BICKFORD.

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Gangrene after Scorpion Sting

SIR,—In his report of a case of gangrene after scorpion sting Dr. M. Y. Ansari (Aug. 21, p. 388) infers that it is a very rare condition. Actually it is not uncommon. A scorpion often stings the same victim several times. I have several times seen a young adult with three or four circular marks on the back, due to putting on a shirt with a scorpion concealed in the inner folds of the garment. The circular marks are often 7–8 cm. in diameter: the first a black disk of dead skin and subcutaneous inflammation; the second a much inflamed plaque with a central necrotic area about 5 mm. in diameter; the third a reddened and swollen circular disk of skin, with no necrosis; the fourth may be just an erythematous area with a circular margin a good deal smaller than any of the earlier lesions. Before the second world war we used anti-scorpion serum made by a German firm, but I think such a serum is now manufactured in this country. The remedy must be used soon after the patient has been stung. Dr. A. H. Mohammed (*Lancet*, 1942, **2**, 364) describes the preparation of anti-scorpion serum. He advises the simultaneous administration of atropine and ergotoxine. Young children can be killed by a scorpion sting; for them the anti-scorpion serum is essential.—I am, etc.,

Epping, Essex. FRANK MARSH.

Repair of Indirect Inguinal Hernia

SIR,—It is refreshing to read a letter like that of Mr. Frank Forty (July 31, p. 268) which gets away from anatomical and physiological theories and faces the fact that in the hands of experienced surgeons the bulk of "recurrences" are not recurrences at all but new and direct herniae at the inner end of the inguinal canal.

Mr. Forty meets this challenge in one way, I in another, but at least we both appreciate two essential points: (1) the importance of exposing the pubic spine and the passage of the crucial first stitch through the dense fibrous structures attached to it, and (2) the importance of relaxing the conjoined tendon so that it is not sutured to the inguinal ligament under tension. If these points are attended to it will be found that the actual percentage of "recurrent" herniae is diminished to a very low figure. Similar results should be recorded by those who claim that a new hypothesis is of fundamental significance.—I am, etc.,

Liverpool. JOHN T. MORRISON.

Use and Abuse of Tonsillectomy

SIR,—I endorse Mr. T. B. Layton's statement (Aug. 7, p. 310) that the profession as a whole should reconsider its approach to tonsillectomy. But it would be disastrous to leave the decision to the parents. Anybody with experience in school tonsil clinics knows that parents who bring their children very often say, "I want my child's tonsils removed," and are more than displeased when told that tonsillectomy is not advised. The point, however, I should like to emphasize is that far too many tonsils are being removed where all that is required is simple adenoidectomy. This is where a clear differential diagnosis must and can be made. Although complete removal of adenoids without damage to the eustachian tube and the pharyngeal mucosa is a much more difficult and skilful operation to perform, it is of course a smaller surgical intervention from the patient's point of view and less liable to complications. Unless there is definite pus in the tonsils and there is tonsillar adenitis present all the benefit from the operation called "Ts and Ads" is derived from the removal of adenoids. I see on an average 800 to 900 patients a year in my capacity of aurist to the Ealing Borough Council, and over a number of years I have practised adenoidectomy only where the tonsils were not obviously infected; with very rare exceptions I have not been obliged to do a subsequent tonsillectomy. I appeal for careful and complete adenoidectomy, without removal of tonsils in every case.—I am, etc.,

London, W.1. ARTHUR MILLER.

Prevention of Venereal Diseases

SIR,—I have read with great interest the replies to Lord Horder's letter (July 17, p. 171) on the prevention of venereal disease. One fact seems to stand out clearly, and it is this—that the crux of the whole matter is the efficacy of prophylactic measures and the extent of their efficacy. This is clearly admitted in the letter of Dr. E. W. Assinder (July 31, p. 269). If it can be shown that such measures are in a large degree effective there can be no doubt that it is the plain duty of the State and medical profession to disseminate the knowledge of these and provide facilities for their adoption.

I ask myself, and I should like to ask the writers of some of their letters, this question: If prophylaxis could be shown to be 100% effective would they still be against it? I cannot help thinking that the moral side would outweigh the social and humanitarian aspects. I would agree with Dr. G. L. Russell (p. 268) that V.D. is not only a medical and social problem but also a human one, but I do not think it is to any great extent a moral one. It is because it is a human problem that all the teaching of the churches has failed to bring about St. Paul's ideal that a man should be "the husband of one wife blameless"—*Naturam expellas furca, tamen usque recurret.*

Illicit sexual intercourse is probably as widespread to-day as it ever was. The incidence of V.D. among our troops in Germany was 185 per thousand. We must suppose that unless every case or most cases of illicit intercourse resulted in infection the incidence of promiscuous sexual relations must have been much higher than this. We must therefore conclude that a very large proportion of Service men are promiscuous, and I doubt if all the exhortations of C.O.s and padres will much reduce this. How far is this a moral question? Morality must always be a relative matter, conditioned by the religious, social, and economic structure of a people. There is no absolute morality, no code laid down by an external law-giver. Probably the only absolutely moral people were, before the missionaries got there, some of the races of the Pacific Islands where sexual intercourse was looked on as an absolutely natural function, and where there was no law in this respect, except some taboos, and therefore no sin.

It would be of great interest to know whether, if Dr. R. C. Webster (p. 269) has found rubber and chemicals inadequate to protect the hands from infective discharges, he has discovered other means, or if he has had to abstain from such contacts—a difficult matter for a syphilologist. I am by no means advocating indiscriminate sexual relations in our society as now constituted, but I do maintain that the question of V.D. will only be obscured if tackled from its doubtful moral rather than its sound economic social and human side.—I am, etc.,

Taynuilt, Argyll. P. F. CHAPMAN, Col., I.M.S.(ret.).

SIR,—The problems of venereal disease and its prevention are of paramount concern to military authorities, and, while it is not claimed that the solution applied in Egypt during the recent war is applicable to all countries, yet as it was so successful then it is worthy of mention.

In the early part of 1942 venereal disease was a serious cause of hospitalization of troops, producing more admissions than battle casualties; 52% of the V.D. cases contracted their disease in the controlled brothels of Cairo. After an investigation into this problem in March, 1942, I suggested that all the brothels in Cairo be put out of bounds; that various counter-attractions such as swimming-pools, cinemas, and sporting events be supplied; and that prophylactic ablution centres (P.A.C.) be decentralized and taken out of the control of the military police.

This proposal met with vigorous opposition from many quarters, including medical, owing to the widespread opinion, as held by Dr. W. B. Laing (Aug. 21, p. 400), that "legalized and controlled prostitution as was carried out until recently in France is the only sure method of V.D. control." My argument was that this control gives false security and encourages men to take risks. Thanks to the support of Brigadiers A. Chrystal, the Area Commander, A. E. Richmond, then D.D.H., and R. Lees, the adviser in venereal diseases, the opposition was overcome and the brothels were put out of bounds in October, 1942.

As I remained in Egypt until June, 1945, I was able to observe the results of this measure. To summarize, it was found among the British troops that: (1) The number of exposures to infection as judged by the attendances at P.A.C.s fell to one-tenth of the pre-closure figures. (2) The incidence of V.D. expressed as a ratio per 100,000 ration-strength (including leave personnel) dropped to one-quarter of the former figure. (3) Cairo was held responsible for only 17% of M.E.F. venereal disease instead of over half. (4) The general conduct, morals, and morale of the troops in this area so improved that on the eve of his departure from Egypt Brigadier Chrystal stated that the closure of the brothels was well worth while for this improvement alone, even if the V.D. rate had remained unaltered, which of course it had not.

Dr. Laing suggested in his recent letter that the termination of legalized and controlled prostitution in France has led to an increase in V.D. This is a most controversial statement, for there are several other factors which may account for the increased incidence.—I am, etc.,

Bletchley, Bucks. A. MICHAEL CRITCHLEY, Late A.D.H. Cairo Area, M.E.F.

SIR,—As a medical student and also as a Christian I am disturbed by the letter of Dr. W. B. Laing (Aug. 21, p. 400) on the subject of the prevention of venereal disease. I would say that the practical solution of the problem of the spread and control of such diseases is more difficult and involves wider considerations than almost any other group of infectious diseases. Having made this general statement I would like to refute the ideas of Dr. Laing that the Church is responsible with the State for "driving sex into back streets and sordid lodgings," an outlook which "favours the spread of V.D." and helps to "transform sexual experience from something beautiful into something ugly and shameful." Such crooked thinking is dangerous, but in one who presumably has an influence in the local community it is a shocking revelation.—I am, etc.,

Manchester, 20. P. WHITE.

SIR,—It is regrettable that the ancient error as to the value of controlled prostitution should be again brought forward by Dr. W. B. Laing (Aug. 21, p. 400). Since even a venereologist cannot exclude syphilis and/or gonorrhoea in a woman without several months' observations and tests, the futility of cursory examinations is obvious. Controlled brothels were out of bounds in several cities during the recent war: this was not on moral grounds, but as a protection against infection. It is a curious fact that in written controversy on the prophylaxis of venereal disease, as also in verbal discussion, the non-specialists are optimistic, the venereologists incredulous.

I have carefully avoided entering on the moral and social aspects of this problem, and would suggest to Dr. Laing that the views of a doctor in his *professional* capacity as to the value of marriage certificates and chastity as an ideal have no special value. It is not easy to see how the bringing of promiscuous sex relations "out of back streets" by a "change in the official outlook of Church and State" would lower the incidence of disease and automatically make the adventures of our patients "beautiful." *T. pallidum* and the gonococcus are no snobs and flourish at any address. In my experience among races whose moral outlook is not that of European Churches and States venereal diseases were very prevalent, and the beauty of these peoples' lives was not particularly obvious, while neuroses seemed quite common.

But let the cobbler stick to his last: as a venereologist I repeat there is no method of prophylaxis of venereal infection which in ordinary life affords any significant degree of security, and in that categorical statement is included condoms and/or chemicals, regulation of prostitution, arsenicals by mouth, measures applied under supervision, and those left to the individual.—I am, etc.,

Todmorden, Lancs. R. C. WEBSTER.

The B.M.A. Under Fire

SIR,—To defend the B.M.A. by saying (Aug. 21, p. 392) that no organization is perfect but, so long as it acts in good faith and with courage, it can withstand criticism recalls Mr. Churchill's remark about our pre-war Government—that it is a fine thing for a Prime Minister to be honest but an important thing for a Prime Minister to be right. Was the B.M.A. right in refusing to allow any discussion of terms of service during the past six years? It has been obvious for all of that time that sooner or later the B.M.A. would offer the services of the profession to the country. When any of us is going to sell something important his first step is to get an opinion of what it is worth: satisfactory negotiation is impossible otherwise. The B.M.A. had a real duty to find out what value the profession put on its services. The evidence given to the Spens Committee would pretty certainly have been affected by such information. It is a doubtful argument to say that a majority of practitioners have approved the Spens Report. A majority of practitioners opposed the health service in the second plebiscite, but the minority view was adopted then. Anyhow, if the B.M.A. had put discussion of terms on divisional agendas years ago it would have been in a far better position to appreciate the difficulties of what it regards as a minority now, instead of spending six years on principles, of which it evolved seven, or slightly more than one principle per annum. I challenge any reader to write down at once those principles (if he remembers them), to reflect on how many have proved essential, and to say that they justify six years of planning committees and executive, divisional, representative, and council meetings. So far as the health service goes no other result emerged.

We still have no agreed opinion as to how many patients a doctor can look after properly, or what income he should have.

There is no conception of what proportion of that income used to come from no-longer-existent contracts or appointments to hospitals, public authorities, schools, etc., nor what is still needed to perform that work in the nature of qualified assistants, domestic or dispensing staff, or housing accommodation. All these points might have been discussed, would have attracted larger attendances in divisions, given a feeling of reality to the matter, and accumulated essential information qualifying the B.M.A. to advise in drafting the regulations which are the important things in the Act now. There was not even a statement that no medical practitioner ought to suffer appreciable loss by entering the service: yet, if the service has seemed to start smoothly, that is because quite a lot of the profession are resigned to more work, often for less pay. The essential trouble with the B.M.A. is that it is unpractical. I hope more correspondents will write frankly about their difficulties, and that the B.M.A. Executive will recognize these more readily than (to judge by letters I have received from widespread correspondents) they have hitherto. I am a strong believer in the possibility of a successful service, but we must be much more honest with ourselves and the public than B.M.A. policy has hitherto allowed us to be.—I am, etc.,

Hove, Sussex. W. A. BOURNE.

Service Doctors in Far East

SIR,—In his reply (Aug. 7, p. 311) to my letter concerning the service of doctors in the Far East I feel that Major-General R. Edgeworth-Johnstone has either deliberately or unintentionally side-tracked the issue. In addition he appears to be ignorant of the regulations governing the granting of family passages. Contrary to what he states, the grant of an Army passage is *not* dependent on the availability of Army quarters. If the officer concerned can provide private accommodation for his family, a passage may be granted. There are in fact two scales of allowances, one for the officer occupying Army quarters and one for the officer in private accommodation.

The points system which the Major-General so carefully outlines has little bearing on the allocation of family passages. I personally know three officers who have the same or less number of points than myself and whose wives were granted passages to Singapore and live in private accommodation. These concessions appear to be available for some and not for others, and it seems to be the policy to put all possible obstacles in the path of the conscript doctor who wishes to bring his wife out to join him.

Many doctors, despairing of the administrative battle, have brought their wives out at their own expense. These officers have been in receipt of the increased allowance paid to officers living with their wives out here. The officer under the age of 25, in addition to receiving only the half-scale ordinary marriage allowance, is on no account entitled to a family passage for his wife. Nor if he arranges and pays for the passage himself is he entitled to the increased local marriage allowance without which it is impossible to live.

I think that penalization of the married officer under 25 is grossly unfair at any time. When it amounts to enforced separation at a time when separation is not necessary (*v.* the large number of military families at present in Singapore) it is nothing short of criminal. No amount of official explanation will make it anything else.—I am, etc.,

Singapore. D. R. MORGAN, Lieut., R.A.M.C.

Shortage of Nurses

SIR,—One of the most important factors preventing the building up in this country of a successful comprehensive health service is the shortage of nurses. Hospitals and other branches of the Health Service are carrying on, in some cases struggling on, with nursing staffs much below the minimum requirements. Hospital beds are lying idle while waiting-lists are expanding. The over-burdened nurses are becoming more dissatisfied, and a vicious circle has been set up, reducing further the already too few.

Much has been done to try and improve the nursing shortage. First, the Rushcliffe Committee introduced better salaries and conditions of service. Their original recommendations followed by many successive improvements were thought to be sufficient inducement, but these have obviously failed. Then the Working Party on the Recruitment and Training of Nurses, under the chairmanship of Sir Robert Wood, investigated very thoroughly the whole matter, and published a very comprehensive report of 116 pages, which in my opinion points out very definitely the seriousness of the position but suggests little or nothing to improve the situation within the next twenty-five years.

It must be admitted that all efforts up to now to build up an adequate nursing service have failed. The reasons for the shortage must be investigated further, and other attractions used to counteract them. The aims to be achieved are (1) to attract sufficient numbers into the profession, and (2) to attract the correct types of persons into the profession (I say persons to include both sexes).

The answer to (1) would appear simple. Give them a big enough salary and you will get the numbers. But what would be the result? Large numbers would commence training with no intention of completing it; others, intending to complete their training and make a profession of nursing, would be so disgusted with some of their colleagues that they would resign; and there would be no incentive for a junior nurse to reach senior status and carry more responsibility. We must, therefore, have such conditions as will achieve both aims—sufficient numbers and correct types.

In my opinion the only way to do this is first to raise nursing to the status of a profession, in fact as well as in name. A student nurse should be considered and should consider herself of equal status as a student of medicine or law or accountancy or any other profession. How is this to be achieved?

The solution, I think, might be found along the following lines. (1) Do not keep increasing the salary of a student nurse, but as soon as she qualifies give recognition to her professional status, and give her an adequate salary—e.g., £300–£350 per annum. This, of course, should increase as her professional skill and responsibility increases. (2) For persons who could not afford the three to four years of training with low salaries, scholarships should be granted to those who prove themselves suitable. Scholarships could be considered by examination or interview. (3) Living and working conditions must be improved in many hospitals. To do this building priority must be given for nurses' homes and hospitals.

I feel sure that only by working along these lines will the strength and status of the nursing profession be improved. And it must be done now. Already the nurses themselves, and many of them are very excellent nurses of the best type, are beginning to lose sight of the fact that nursing is a glorious and noble profession. Backsliding is easy, but progress can only be achieved by strong and immediate efforts.—I am, etc.,

South Shields. N. STRANG.

POINTS FROM LETTERS

Guild of St. Luke

Dr. H. M. RAVEN (Broadstairs) writes: There have been several communications in the *Journal* lately on the subject of doctors, clergy, and healing. The main link between the two professions used to be the Guild of St. Luke. The officers of the guild are apparently not functioning; I believe the Provost, Dr. Bokenham, has died. Would it be possible to revive the guild, which has had an honourable past and which must still contain many members, including myself. Perhaps a meeting of old members and others interested, to be held at B.M.A. House, would be allowable and useful. This letter may catch the eye of an ex-official of the Guild of St. Luke, and I hope he may feel inclined to take the initiative.

World Food Shortage

Dr. H. M. STEPHENSON (London, S.W.5) writes: In a leading article (Aug. 14, p. 345) you praise the optimism of Sir John Boyd Orr for his belief that the nations of the world may yet show as much concern about feeding the 2,500 million people in the world as in feeding the 2½ million people in Berlin. A facile optimism can be shown by anybody who belittles a problem by mis-stating it. The problem is not to feed 2,500 million people but to feed 2,500 million people who are increasing at the rate of 1% per annum. . . . The 40 million square miles of cultivable land in the world might support in food a total of 6,000 million people. . . . At the present rate of increase that total will be reached in about 50 years. Improved agriculture may defer the disaster for perhaps another decade. I can think of no remedy that mankind—which includes their churches—would accept. But surely realizing the truth of a problem may induce first a few and then the many to try to solve it. . . .

Obituary

J. E. H. ROBERTS, O.B.E., M.B., F.R.C.S.

James Ernest Helme Roberts died on Aug. 25 at his home in Ottershaw, at the age of 67, after a long illness during which he maintained a remarkably keen interest in the activities of all his old friends, although he was fully aware of the fatal prognosis. He will go down in medical history as one of the great pioneers in surgery of the chest, for his interest in this specialty started in the 1914–18 war and was sustained through all the vicissitudes of its infancy; those practising thoracic surgery to-day must realize how much they owe to the courage of men like Roberts.

Born in West Bromwich, Staffs, he was educated at King Edward's School, Birmingham, and subsequently studied medicine at St. Bartholomew's Hospital. After qualifying M.R.C.S., L.R.C.P. in 1906 he graduated M.B., B.S. with honours in surgery in 1908, and proceeded to the Fellowship of the Royal College of Surgeons the following year. Of numerous house appointments there is no doubt that Roberts valued his period of service as house-surgeon to Mr. C. B. Lockwood at St. Bartholomew's Hospital more than any other, for he repeatedly referred to his teachings. Roberts's amazing powers of observation were probably developed through his study of natural history, but Lockwood's example may well have emphasized for him the importance of training this faculty. He was later appointed part-time demonstrator of pathology, and this influenced his approach to medicine throughout his career, for his hospital visits were rarely completed without his "dropping in" to see the pathologist to discuss some problem connected with the work in the ward. Concurrently he held the post of chief assistant to the orthopaedic department, and this period of training was never forgotten, for even when his surgical work had become almost confined to the chest his interest would always be particularly aroused by any abnormality of the bones or joints. A child with an obstructed diaphragmatic hernia became a doubly fascinating problem when discovered to suffer from diaphysial aclasis as well.

Roberts learnt to appreciate the importance of studying children and their diseases as a house-physician at Great Ormond Street, and in 1913 he was appointed assistant surgeon to the East London Hospital for Children. Children are better judges of human character than many would suppose, for they choose for their adult friends those with patience, kindness, and absolute honesty, all of which Roberts had in abundance. These basic qualities, combined with his special training, were responsible for his remarkable success in handling children. He served in the first world war from 1914 to 1919 and was thrice mentioned in dispatches. The excellence of his work as a surgical specialist with No. 5 General Hospital and No. 41 Casualty Clearing Station was recognized officially by the award of the O.B.E. Before 1914 the surgery of the chest was more or less confined to drainage of empyemas, and it was during his war service that Roberts, having dealt successfully with large numbers of major wounds of the chest, realized that the knowledge gained might well be employed in bringing relief to conditions other than wounds. After the war his work for the wounded was continued by his appointment as surgeon to Queen Mary's Hospital, Roehampton.

In 1919 he was appointed assistant surgeon to St. Bartholomew's Hospital, where he was destined to become senior surgeon before his retirement from hospital practice in 1946. Practitioners of to-day who had the good fortune to serve Roberts as dressers in their student days will recall how much they owe to his teaching. He always stressed principles rather than details, and always emphasized the practical nature of the work of a doctor. He prided himself on his knowledge of practical nursing, and there must be many who remember the embarrassment of being asked to describe exactly how to prepare raisin tea or Imperial drink. Nothing annoyed Roberts more than cloaking ignorance with verbosity, and his irritation would reach its zenith if this was wilfully done, for deceit was anathema to him. He was a purist and insisted that others should be equally accurate: the expressions "almost," "nearly," "not quite" would always bring forth one of his fund of stories. His teaching in general surgery was remarkable for its clarity and simple logic; any student who heard him discuss intestinal obstruction would never afterwards delay in taking steps to confirm such a diagnosis. Although his name will always be connected with chest surgery, he was ever in the vanguard of general surgical progress. For example, he was performing gastrectomies for intractable gastric ulceration when many other surgeons were still practising gastro-jejunostomy. There was no limit to his courage as a surgeon so long as the patient's disease warranted drastic measures, and in the operating theatre he was at his best when undertaking truly formidable procedures.

It was his appointment as surgeon to the Brompton Hospital in 1919 which gave Roberts the opportunity to develop his interest in chest surgery and so to become one of the world's most famous thoracic surgeons. He was not a prolific contributor to medical literature, so that the propagation of his work was largely by personal teaching, which always proved a great stimulus to the younger surgeons because he was ever ready to discuss their problems. He is justly credited with being the originator of an excellent plastic operation for some cases of chronic empyema which is now usually designated the "Roberts flap operation." He was a frequent and much-valued speaker at meetings, and was at one time president of the Medical Society of London, of the Society of Thoracic Surgeons, and of the Tuberculosis Association. His desire to do everything possible to raise the standard of treatment of the tuberculous, and his ability to divest a problem of its trappings so as to see the essentials, resulted in his serving on the Joint Tuberculosis Council for more than ten years and on the Standing Advisory Committee on Tuberculosis to the Ministry of Health for four years. He was particularly interested in the international aspects of surgery, and was for many years the British delegate on the committee of the Société Internationale de Chirurgie. His work was recognized abroad by his election to honorary membership of the American Association of Thoracic Surgeons and of the Polish Society of Surgeons.

Roberts generated a striking loyalty and affection among those who served him, and there are many who feel a deep personal loss in his death. Fundamentally a shy man, he covered any self-consciousness with a forthright, almost aggressive manner which was not always completely understood by his contemporaries. His interests were by no means confined to medicine, so that there was hardly any subject of conversation to which he could not make some valuable contribution. He was an enthusiastic alpine gardener, and was probably more proud of his awards as a member of the Alpine Garden Society than of many surgical triumphs; he was also a well-known authority on dragon-flies. His leisure pursuits were such that he was well equipped to enjoy the retirement which has been denied him. To his widow, a sister of the late R. C. Elmslie, the orthopaedic surgeon, the sympathy of all his colleagues and friends will be extended.

P. R. LOWE, O.B.E., M.B.

Dr. P. R. Lowe, who died on Aug. 18 at the age of 78, had an international reputation as a student of ornithology and was for many years in charge of the bird-room at the British Museum.

Percy Roycroft Lowe was born at Stamford, Lincolnshire, and was educated privately and at Jesus College, Cambridge, and Guy's Hospital. He graduated in 1899, and soon afterwards became senior house-physician at Leicester Infirmary, and later senior house-surgeon at the Derbyshire Royal Infirmary. He was one of the civil surgeons selected by the War Office for service in the South African war and was appointed medical officer in charge of Princess Christian's hospital train. It was during his service in the field that his interest in ornithology began. Returning from South Africa, he became private physician to Sir Frederic Johnstone, Bt., and with him made a number of voyages to the West Indies and collected no fewer than 3,000 birds from practically every island in the Caribbean Sea as well as from Cape Verde, the Canaries, Madeira, and the Azores. In 1916 Dr. Lowe served in the Mediterranean in Lord Dunraven's yacht, which was

fitted up as an officers' ambulance ship and plied from Malta. Returning home, he was commissioned as a captain in the R.A.M.C. and was appointed to command Princess Christian's new ambulance train, a post which he filled for three years.

At the end of the war Dr. Lowe succeeded the late Mr. W. R. Ogilvie Grant in charge of the bird-room at the Natural History Museum and set himself to reorganize the collections there. He was given charge of the osteological collection, which previously had been kept entirely separate from the collection of skins. Over the next twenty years Dr. Lowe contributed greatly to the classification of waders and to the understanding of the relationship of these birds to one another as well as to other families and groups. His paper on the finches of Gough Island shows the thoroughness with which he investigated every problem, and he was also responsible for important work on the anatomy of ostriches and penguins. The British Section of the International Committee for Bird Preservation, of which he was first secretary and then chairman for many years, owed much of its effectiveness to his untiring energy. Dr. Lowe was vice-president of the British Ornithologists' Union from 1934–6 and president from 1938–43. As recently as 1946 he was awarded the Salvin-Godman Gold Medal of the Union for outstanding work on bird anatomy and on the protection of birds.

Dr. ANDREW RADBURNE FULLER, of Perranporth, Cornwall, died suddenly on July 19 at the age of 55. He was born in London, the elder son of Dr. Andrew Fuller, chief medical officer for England and Wales under the Local Government Board. He was educated at Leighton Park School and St. Mary's Hospital, at both of which he won open scholarships. In September, 1914, he went to France with the Red Cross as a medical orderly, returning in 1915 to work for his final examination, which he took in 1916. He was immediately commissioned in the R.A.M.C. and posted as a battalion M.O. to a division in the Battle of the Somme. Early in 1917 he was invalided home to spend many weary months in hospital, before being invalided out in 1920. Dr. Fuller subsequently took his D.P.H. and joined his father, who was then in practice at Perranporth. There he remained until his untimely death. He was always a keen athlete and was a first-class cricketer and tennis player, holding the Cornish singles championship for three successive years and also playing first couple for the county. Dr. Fuller will long be remembered by all in Perranporth and the surrounding district for his exceptional medical ability and devotion to his work, which he combined with a sincere and unselfish love of his fellowmen. He upheld the finest traditions of the profession. He married in 1925 Elizabeth Mary, younger daughter of Dr. Peter Ingram, of London, who, with two children, survives him.—C. B. S. F.

Dr. ROBERT EVANS THOMAS, whose sudden death on July 30, at the age of 66, came as a shock to his friends, was associated for some twenty-seven years with the Bath Health Department, for much of that time as deputy medical officer of health and deputy school medical officer. He was the son of a Bristol solicitor, and went to school at Clifton and Felsted. Receiving his medical education at Bristol, he qualified in 1906, graduated M.B., B.S. two years later, and proceeded M.D. in 1911, taking the D.P.H. in 1915. Resident posts, experience of private practice, and service in France during the 1914–18 war were followed by an appointment in the school medical service at Manchester. A little later, in 1920, he came to Bath, and he remained there for the rest of his life. Dr. Thomas's most notable work was done in connexion with maternity and child welfare and school medicine, and both those services in Bath owe a great deal to his keen interest, sound judgment, and outstanding clinical ability. A crippling arthritis, which he bore with admirable courage, led to his retirement from his post as deputy medical officer in 1938. A year later, however, on the outbreak of war, he was recalled to take charge of the municipal antenatal clinics at Rivers Street, where his services were so much appreciated that he continued to attend several times a week until the day of his death. His patients soon discovered the deep personal interest Dr. Thomas took in their welfare, and they had the greatest confidence in whatever advice he gave. He gained the sincere respect of all with whom he came in contact and will always be remembered by his colleagues with the most friendly and affectionate regard.—J. F. B.

Universities and Colleges

UNIVERSITY OF WESTERN AUSTRALIA

On the occasion of the Australasian Medical Congress, held at Perth last month, the honorary degree of D.Sc. was conferred on the following: Frank Macfarlane Burnet, M.D., F.R.S., Professor of Experimental Medicine in the University of Melbourne and Director of the Walter and Eliza Hall Institute for Medical Research, Melbourne; Sir Henry Simpson Newland, C.B.E., D.S.O., M.S., F.R.C.S., F.A.C.S., F.R.A.C.S., a Vice-President of the British Medical Association, President of the Federal Council of the B.M.A. in Australia for the last 18 years, and President of the Royal Australian College of Surgeons from 1929 to 1934; James Calvert Spence, *M.C.*, M.D., F.R.C.P., Professor of Child Health in the University of Durham; and Frank Burton Walsh, M.D., Professor of Ophthalmology at the Johns Hopkins Medical School, Baltimore, U.S.A.

SOCIETY OF APOTHECARIES OF LONDON

A course of ten postgraduate subscription lectures on modern therapeutics will be delivered in the Hall of the Society (Black Friars Lane, Queen Victoria Street, E.C.) between Oct. 18 and Nov. 5, at 5 p.m., both dates inclusive. The fee for the whole course is £3 3s. (single lectures, 7s. 6d.) Details of the lectures will be published in the diary column of the *Journal* week by week.

At a recent meeting of the Court of Assistants Professor E. C. Dodds, F.R.S., was re-elected Master of the Society for a further year from Aug. 17 and Mr. Duncan C. L. Fitzwilliams and Dr. Frank D. Howitt were elected Wardens. The reports of the deaths of Dr. C. H. T. Ilott, late Assistant, and Sir George Newman, Honorary Freeman, were received with great regret. Dr. Reginald Fisher was welcomed to a seat on the Court. Sir Cecil Wakeley was re-elected representative of the Society on the Governing Body of the British Postgraduate Medical Federation.

The following diplomas were granted:

MASTER OF MIDWIFERY.—G. H. Hall, R. Hodgkinson, J. I. Miller, C. M. Stacey, G. F. Newbold, M. O. Will.

DIPLOMA IN INDUSTRIAL HEALTH.—J. N. Heales, W. A. B. Reynard, F. Wrigley, S. J. M. Walker, D. G. Robinson, C. H. Hoskyn.

L.M.S.S.A.—V. E. S. Rolfe, P. G. Green, F. R. Walker, O. B. Beardsley, G. Capper, E. R. Ettlinger, J. A. W. Berryman, B. Newton, J. S. Swifte, K. H. Ghobrial, A. C. Bojé, N. Rivers, D. Davis, A. D. Griffith, S. P. Lapage, A. I. Berwitz, N. B. Kenyon, W. Bust, N. Kacas, D. F. Little, R. J. F. Moore, A. J. Glyn, M. V. Salmon, W. B. Wolstenholme, W. Winterstein, R. J. H. Snelson.

The Services

Major-General A. H. Harty, C.I.E., late I.M.S., has relinquished the appointment of Honorary Physician to the King on retirement.

Major-General D. V. O'Malley, C.B., O.B.E., I.M.S., has relinquished the appointment of Honorary Surgeon to the King, on retirement.

Colonel (Temporary Brigadier) W. H. B. Bull, O.B.E., E.D., Royal New Zealand A.M.C., has been appointed Honorary Surgeon to the King in succession to Colonel K. McCormick, C.B., C.B.E., D.S.O., E.D., who has been posted to the Reserve of Officers.

Colonel (Temporary Major-General) F. K. Norris, C.B.E., D.S.O., E.D., A.A.M.C., and Colonel R. D. King, C.B.E., D.S.O., Royal New Zealand A.M.C., have been appointed Honorary Physicians to the King in succession to Major-General S. R. Burston, C.B., C.B.E., D.S.O., E.D., A.A.M.C., retired, and Colonel F. T. Bowerbank, K.B.E., M.C., E.D., retired, respectively.

In Circular 140/48 the Ministry of Health has drawn the attention of county district councils to the fact that in accordance with the Tenth Schedule of the National Health Service Act, 1946, the medical officer of health of the council is now required to send to the county council, as local health authority, a copy of a notification of infectious disease within 12 hours of its receipt. This applies to notifications received under Sections 144, 146, and 242 of the Public Health Act, 1936, or of any infectious disease occurring in a common lodging house. The wording of the passage referred to in the Tenth Schedule of the National Health Service Act does not specifically extend to such infectious diseases as have from time to time been made notifiable by regulations under Section 143 of the Public Health Act (or earlier enactment). But the Ministry considers it necessary that for these diseases also copies of notifications should be sent to the county council in the same way.

No. 33

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended Aug. 14.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1948					1947 (Corresponding Week)				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	38	4	23	1	1	60	6	33	2	2
Deaths		—	—				1	—		
Diphtheria	106	14	31	7	4	145	12	39	8	8
Deaths	—	—	—		—	—	—	—	1	—
Dysentery	107	15	50	—	1	66	10	14	—	—
Deaths					—				—	—
Encephalitis lethargica, acute	—	—	—	1	—	4	1	1	—	—
Deaths		—					—			
Erysipelas			28	9	—			19	3	—
Deaths		—					—			
Infective enteritis or diarrhoea under 2 years				28					57	
Deaths	33	2	9		2	66	3	21	8	1
Measles*	5,897	287	47	40	34	4,468	229	43	254	6
Deaths†			—		—	2	—	—	3	—
Ophthalmia neonatorum	75	6	16	—	—	65	5	15	—	—
Deaths										
Paratyphoid fever	19	1	—	—	—	17	—	1 (B)	—	—
Deaths	—	—	—		—	—	—	—	—	—
Pneumonia, influenzal	282	13	4	2	4	253	9	3	—	3
Deaths (from influenza)‡	—	—	—		—	3	—	—	1	—
Pneumonia, primary			101	19				117	11	
Deaths	114	17			7		15			3
Polio-encephalitis, acute	2	—				45	8			
Deaths							1			
Poliomyelitis, acute	37	2	1	1	—	646	89	134	10	20
Deaths§	2	—					3			
Puerperal fever		1	12		—		3	13		1
Deaths										
Puerperal pyrexia‖	88	7	9	—	—	127	3	15	2	—
Deaths		1					—			
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	774	33	122	45	15	614	54	114	21	26
Deaths†			—		—	—	—	—	—	—
Smallpox	—	—	—		—	—	—	—	—	—
Deaths					—					
Typhoid fever	8	1	2	—	—	8	1	2	2	—
Deaths	1	—	—		—	—	—	—	—	—
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths					—				—	—
Whooping-cough*	3,458	228	23	55	14	1,870	203	64	70	12
Deaths	9	—	—		—	5	—	2	1	—
Deaths (0–1 year) Infant mortality rate (per 1,000 live births)	274	24	28		17	324	30	50	21	9
Deaths (excluding still-births)	3,710	547	494		102	3,765	536	455	168	76
Annual death rate (per 1,000 persons living)			10·0					9·5		
Live births	8,027	1303	947		259	9,004	1420	1027	363	241
Annual rate per 1,000 persons living			19·1					20·7		
Stillbirths	198	25	30			253	29	37		
Rate per 1,000 total births (including stillborn)			31					35		

* Measles and whooping-cough are not notifiable in Scotland, and the returns are therefore an approximation only.

† Deaths from measles and scarlet fever for England and Wales, London (administrative county), will no longer be published.

‡ Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

§ The number of deaths from poliomyelitis and polio-encephalitis for England and Wales, London (administrative county), are combined.

‖ Includes puerperal fever for England and Wales and Eire.

The return of births and deaths in Eire for the weeks ended Aug. 7 and 14 has not been received.

EPIDEMIOLOGICAL NOTES

German Vital Statistics

According to the *Monthly Statistical Bulletin* (June, 1948) of the Control Commission for Germany (British Element) the provisional result of the population census at Oct. 29, 1946, showed that the population of Germany was 65,898,900, of which 22,344,900 are in the British Zone and 605,300 in the British Sector of Berlin. In the first quarter of 1948 the infant mortality rate in the British Zone was 90 and the neonatal rate was 39. The comparable figures in the British Sector of Berlin were 107 and 49. During May, 1948, the daily average percentage of occupied beds in hospitals in the British Zone were as follows: general hospitals 87; hospitals for infectious diseases 68; hospitals for nervous disorders 95; hospitals for children's diseases 88; tuberculosis hospitals 93.

Discussion of Table

In *England and Wales* a decrease in the number of notifications was reported for measles 982, scarlet fever 74, acute pneumonia 81, and paratyphoid fever 28, while only whooping-cough 273 increased in incidence.

The incidence of measles continued to fall throughout the country; the largest falls during the week were London 143 and Yorkshire West Riding 115. A small decrease in the notifications of scarlet fever was general but no large local variations occurred.

The largest increases in the incidence of whooping-cough were Yorkshire West Riding 68, Lancashire 61, and Sussex 38. The notifications of diphtheria during each of the last three weeks have fallen to a new record low level. The largest returns of diphtheria during the week were Lancashire 18, London 14, and Durham 13.

Outbreaks of dysentery notified during the week were in Surrey, Coulsdon and Purley U.D., 24 and Oxfordshire 9. The other large centres of dysentery were London 15, Warwickshire 15 (Warwick R.D. 10), and Lancashire 11. Notifications of acute poliomyelitis have been practically constant during the past five weeks, and the largest returns during the week were Lancashire 4, Middlesex 4, Yorkshire West Riding 4 (Sheffield C.B. 2), Glamorganshire 3 (Cardiff R.D. 2), and Kent 3; 2 cases were notified from Essex, West Ham C.B.

In *Scotland* the chief feature of the returns was an increase of 20 in the notifications of dysentery. The largest centres of infection were Glasgow 25 and Edinburgh 10.

In *Eire* a decreased incidence was recorded for diarrhoea and enteritis 15 and whooping-cough 24, while increases were reported for scarlet fever 16.

In *Northern Ireland* only small fluctuations were reported in the trends of infectious diseases. An outbreak of poliomyelitis affecting 11 persons was announced by the Ministry of Health on Aug. 16.

Week Ending August 21

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 736, whooping-cough 3,260, diphtheria 116, measles 4,611, acute pneumonia 266, cerebrospinal fever 26, acute poliomyelitis 72, dysentery 111, paratyphoid fever 20, typhoid fever 8.

Medical News

Prize Essay on Colonial Tuberculosis

A prize of one hundred guineas will be awarded by the National Association for the Prevention of Tuberculosis for an essay on "The Control of Tuberculosis in a British Colony." The competition is open to doctors in the British Colonial Medical Service who are of not more than ten years' or less than five years' medical standing, of which at least three years have been spent overseas in a medical capacity. Competitors should describe their own proposals for a practical scheme for the clinical, social, and administrative control of tuberculosis, either in the British Colonies as a whole or in one or more of them separately. Writers should give their own opinions based on personal experience of public health and anti-tuberculosis work. Essays should reach Dr. Harley Williams, N.A.P.T., not later than March 1, 1949. Award of the prize will be notified at the N.A.P.T. Commonwealth and Empire Conference, which is to be held in London in July, 1949.

Unesco Publication

Unesco has issued a "List of Scientific Papers Published in the Middle East." The introduction is in French and English, and the titles of papers in Arabic are translated into one of these languages. The list includes those papers received by Unesco up to March 1 of this year.

Extra Rations for Tuberculous Patients

The Ministry of Food has announced that patients with active tuberculosis who are receiving additional allowances of milk, bacon, and cooking fat are to be granted an extra three ounces of butter or margarine and an extra three eggs a week. Patients who are eligible for this extra food can obtain the necessary permit by taking or sending their ration books to their local food office.

Whitley Council for Nurses

The names of the representatives of the management and staff sides of the Whitley Council for Nurses and Midwives were published in the *Supplement* of Aug. 21 (p. 89). The name of Dr. R. H. H. Jolly, medical officer of health of Wolverhampton, should be added as the second representative of the Association of Municipal Corporations.

School Meals Service

The National Council of Social Service has just published a booklet, *The Social History of the School Meals Service*, by Mr. F. Le Gros Clark. The author traces the development of school meals as a new social institution. At the end of the nineteenth century school meals were regarded as an occasional charity for poor children. The changes which have taken place from then to the present day are fully described and some of the more recent developments are illustrated. Copies of the booklet (price 2s.) may be obtained from the National Council of Social Service, 26, Bedford Square, London, W.C.1.

COMING EVENTS

Refresher Courses in Paris

Refresher courses in medicine, surgery, and the specialties will be held in October at the Hôpital Bichat, Paris, XVIIIe. Further information may be obtained from Expansion Scientifique Française, 23, rue de Cherche-Midi, Paris.

Congress of Biological Chemistry

The 8th Congress of Biological Chemistry will be held in Paris on Oct. 6–8. Information may be obtained from M. Jean Courtois, Secrétariat du Congrès, 4, Avenue de l'Observatoire, Paris, VIe.

Refresher Courses in Tuberculosis

The National Association for the Prevention of Tuberculosis has arranged the following refresher courses: "Radiology in Connexion with Tuberculosis and Chest Diseases," at Leeds University, Sept. 20–22. Fee, £4 4s.; limited inclusive accommodation at Leeds University Hostel, £2 15s. "The Treatment of Non-pulmonary Tuberculosis, including Lupus," at Lord Mayor Treloar Cripples' Hospital, Alton, Hants, Oct. 5–7. Fee, £3 3s.; reserved hotel accommodation: approximately £1 1s. per day, dinner, bed, and breakfast. Course limited to 16. Clinical Courses at the Cheshire Joint Sanatorium, Market Drayton, Salop, Oct. 26–28, Nov. 23–25, and Dec. 7–9. Fee: £3 3s.; hotel accommodation in Market Drayton can usually be obtained at approximately £1 1s. per day, dinner, bed, and breakfast. Courses limited to four.

Health Education Courses for Public Health Nurses

The Central Council for Health Education is arranging two-day courses of lectures on the subject of health education for health visitors, midwives, district nurses, school nurses, etc., in the undermentioned university centres: Birmingham, Sept. 13–14; Bristol, Nov. 1–2; Cambridge, Oct. 18–19; Cardiff, Oct. 25–26; Leeds, Oct. 4–5; Liverpool, Sept. 20–21; Manchester, Sept. 23–24; Newcastle, Oct. 14–15; Oxford, Oct. 11–12; Sheffield, Oct. 7–8. Courses are also arranged in Belfast, London, Middlesex, Essex, Kent, and Surrey, particulars of which can be obtained from the Medical Adviser and Secretary of the Central Council for Health Education, Tavistock House, Tavistock Square, London, W.C.1. Under the general title of Health Education, lectures will be given on physiology, psychology, social factors affecting health, child health, educational methods, and the practice of health education. A member of the staff of the Central Council will take part in each course, but the majority of the lectures will be given by appropriate senior members of university staffs. No charge will be made for nurses nominated by officers of local authorities, to whom application to attend should be made.

Radioactivity in Inorganic Chemistry

Three postgraduate lectures on "The Impact of Radioactivity in Inorganic Chemistry" will be delivered by Professor H. J. Emeléus, F.R.S., on Sept. 30, Oct. 7, and Oct. 14 at the Royal Institution, 21, Albemarle Street, London, W.1. Admission will be by ticket (10s. for the three lectures) obtainable from Mr. H. C. Worsdall, London Section, O.C.C.A., c/o Plastanol, Ltd., Crabtree Manorway, Belvedere, Kent. Junior members may attend free but must apply for complimentary tickets.

SOCIETIES AND LECTURES

Tuesday

INSTITUTE OF LARYNGOLOGY AND OTOLOGY, 330, Gray's Inn Road, London, W.C., Sept. 7, 9.30 a.m. "*Non-operative Treatment of Maxillary Sinusitis*," by Mr. Myles L. Formby.

Friday

EDINBURGH POSTGRADUATE BOARD FOR MEDICINE.—At Anatomy Lecture Theatre, Edinburgh University, Sept. 10, 3.30 p.m. "*Localization of Cerebral Function*," by Dr. W. Ritchie Russell.

APPOINTMENTS

DICKIE, G. G., M.B., Ch.B., D.P.H., Medical Officer of Health, Barrow-in-Furness.

MOORE, E. H., M.B., Ch.B., D.P.H., Medical Officer of Health for Sale and Lymm and Divisional Medical Officer and School Medical Officer for Cheshire.

BIRTHS, MARRIAGES, AND DEATHS

BIRTHS

Essex-Cater.—On Aug. 11, 1948, at Paddington Hospital, to Jane (née Binning), wife of Dr. Antony Essex-Cater, F.R.A.I., a son—Jonathan.

Graves.—On Aug. 23, 1948, to Valerie, wife of Dr. J. C. Graves, a son.

Quinn.—On Aug. 24, 1948, to Mary (née McKenna), wife of Dr. Brian S. Quinn, of 116, Kenilworth Gardens, Westcliff-on-Sea, a son—Niall Patrick.

DEATHS

Alderson.—On May 29, 1948, Esther Violet Alderson (née Adderley), M.B., B.Ch., Dublin.

Berry.—On Aug. 26, 1948, Noel William Berry, M.R.C.S., L.R.C.P., of Langton House, Bury Road, Alverstoke, Hants.

Brogden.—On Aug. 27, 1948, at Brackendale, Maybury, Woking, Surrey, George Alexander Brogden, M.D.Ed., aged 78.

Burton.—On Aug. 23, 1948, at Oakdale, Frodsham, Cheshire, William Edward Burton, J.P., M.R.C.S., L.R.C.P., D.P.H., aged 82.

Carver.—On Aug. 25, 1948, at Sutton Courtenay, John Robertson Carver, M.D., D.P.H.

Cobban.—On Aug. 21, 1948, at an Edinburgh nursing home, Alexander Lee Cobban, M.B., C.M.

Cuff.—On Aug. 17, 1948, at Nicosia, Cyprus, Cyril Charles Herbert Cuff, O.B.E., F.R.C.S.Ed.

Higgs.—On Aug. 12, 1948, at St. Leonards-on-Sea, Walter Alpheus Higgs, M.R.C.S., L.R.C.P.

Jamieson.—On Aug. 20, 1948, at 8, Waltham Terrace, Blackrock, Dublin, John Kay Jamieson, Hon. LL.D., M.B., C.M.Ed., late Professor of Anatomy, Trinity College, Dublin, and Leeds University.

Leggate.—On Aug. 24, 1948, at 11, Devonshire Road, West Kirby, Archibald Renwick Leggate, M.B., Ch.B.Ed., late of Manchuria, aged 71.

Lowbury.—On Aug. 24, 1948, at 21, Menelik Road, London, N.W., Benjamin William Lowbury, M.D.

Lowe.—On Aug. 18, 1948, Percy Roycroft Lowe, O.B.E., M.B., late of the British Museum (Natural History), aged 78.

Lowry.—On Aug. 20, 1948, James Arthur Lowry, M.D., R.U.I., of 49, High Street, Fareham, Hants.

Maclagan.—On Aug. 18, 1948, at Port Lodge, Dunbar, Donald Robert Clarke Maclagan, M.B., Ch.B.Ed.

Manby.—On Aug. 19, 1948, Walter Edward Manby, M.B., B.C., of Pembroke, aged 83.

Nesbitt.—On Aug. 17, 1948, Charles van Homrigh Nesbitt, M.D., of Liverpool Road North, Maghull, Liverpool, aged 84.

Parmiter.—On Aug. 19, 1948, at the Victoria Cottage Hospital, Wimborne, Dorset, Bernard Rayne Parmiter, M.B., B.S.

Perceval.—On Aug. 19, 1948, at 28, Branksome Wood Road, Bournemouth, John Lansdowne Perceval, M.R.C.S., L.R.C.P., dearly loved husband of Winifred, late of Childe Okeford, Dorset, aged 61.

Pugh.—On Aug. 19, 1948, Stephen Horatio Pugh, F.R.C.S.Ed., of Maes-y-Coed, Builth Wells, Breconshire.

Pym.—On Aug. 5, 1948, at Burwood, N.S.W., Australia, Charles Brownlow Pym, M.R.C.S., L.R.C.P.

Ritchie.—On Aug. 20, 1948, at Sheffield Royal Infirmary, Alexander Ritchie, M.B., Ch.B., D.P.H.

Roberts.—On Aug. 25, 1948, at The Croft, Brox Road, Ottershaw, James Ernest Helme Roberts, O.B.E., F.R.C.S.

Thomas.—On July 30, 1948, Robert Evans Thomas, M.D., D.P.H., of Bath, aged 66.

Young.—On Aug. 28, 1948, at Hazeldon, Tavistock, Devon, Augustus Henry Owen Young, L.R.C.P.&S.I. and L.M., Lieutenant-Colonel R.A.M.C., retired.

All communications with regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, LONDON, W.C.1. TELEPHONE: EUSTON 2111. TELEGRAMS: *Aitiology, Westcent, London.* ORIGINAL ARTICLES AND LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone unless the contrary be stated.

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